

**PROPOSED INSTALLATION AND OPERATION
OF AN EXPLOSIVE DESTRUCTION TECHNOLOGY
FACILITY AT THE BLUE GRASS ARMY DEPOT,
RICHMOND, KENTUCKY**

ENVIRONMENTAL ASSESSMENT



June 2013

**PROGRAM EXECUTIVE OFFICE
ASSEMBLED CHEMICAL WEAPONS ALTERNATIVES
Aberdeen Proving Ground, Maryland**

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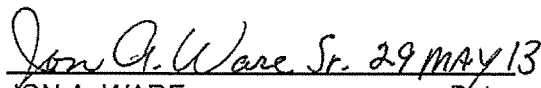
ENVIRONMENTAL ASSESSMENT

Lead Agency: Department of the Army; Program Executive Office,
Assembled Chemical Weapons Alternatives (ACWA)


Title of Proposed Action: Proposed Installation and Operation of an Explosive
Destruction Technology Facility at the Blue Grass Army
Depot, Richmond, Kentucky

Affected Jurisdiction: Madison County, Kentucky

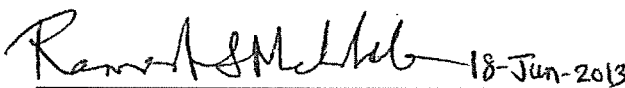
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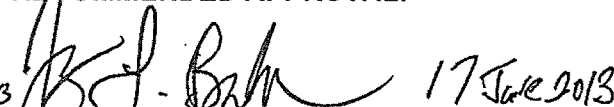
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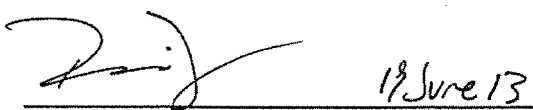
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ORGANIZATION OF THIS ENVIRONMENTAL ASSESSMENT

This Environmental Assessment (EA) evaluates the environmental effects of the Army's proposed action: installation and operation of an explosive destruction technology (EDT) facility at the Blue Grass Army Depot (BGAD) in Kentucky. The proposed EDT facility would assist with the destruction of a limited portion of the depot's inventory of chemical agents and munitions [specifically, all of the projectiles and Department of Transportation (DOT) bottles filled with mustard blister agent] that present problems with their destruction in the Blue Grass Chemical Agent-Destruction Pilot Plant (BGCAPP), which is being constructed at the BGAD.

- SECTION 1 INTRODUCTION** summarizes the purpose of and need for the proposed action and provides relevant background information about the chemical agents and munitions to be destroyed at the BGAD under this proposed action.
- SECTION 2 PROPOSED ACTION AND ALTERNATIVES** describes in detail the proposed action and the no-action alternative, as well as other alternatives to the proposed action.
- SECTION 3 THE AFFECTED ENVIRONMENT AND POTENTIAL ENVIRONMENTAL CONSEQUENCES** describes the existing environmental resources that could be affected by the proposed action and identifies the potential environmental impacts of implementing the proposed action and of the no-action alternative.
- SECTION 4 CONCLUSIONS** summarizes the findings about the potential environmental impacts for the proposed action and no-action alternative, and makes a recommendation on whether to proceed with a draft Finding of No Significant Impact.
- SECTION 5 PERSONS CONTACTED AND CONSULTED** provides a listing of those individuals who were contacted to provide data and information for the analyses in this EA, as well as those who contributed to the preparation of this EA through their analyses and expert reviews.
- SECTION 6 REFERENCES** provides bibliographic information for cited reference materials.

ACRONYMS AND ABBREVIATIONS

µg	microgram (one millionth of a gram)
AADT	annual average daily traffic
ac-ft	acre-foot
ACWA	Assembled Chemical Weapons Alternatives
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model (an atmospheric dispersion computer model)
AFSS	advanced fragment suppression system
AR	Army Regulation
atm	standard atmospheric pressure
BGAD	Blue Grass Army Depot (in Kentucky)
BGCA	Blue Grass Chemical Activity
BGCAPP	Blue Grass Chemical Agent-Destruction Pilot Plant
BMPs	best management practices
CAA	Clean Air Act
CAC	Citizens' Advisory Commission
CDCAB	Chemical Destruction Community Advisory Board
CDD	chlorodibenzodioxin
CDF	chlorodibenzofuran
CEQ	Council on Environmental Quality
CFR	<i>Code of Federal Regulations</i>
CMA	U.S. Army Chemical Materials Activity (formerly the U.S. Army Chemical Materials Agency)
CO	carbon monoxide
CO ₂	carbon dioxide
COPC	chemical of potential concern
CT	census tract
CWA	Clean Water Act
CWC	Chemical Weapons Convention
DAVINCH	Detonation of Ammunition in Vacuum Integrated Chamber
dB(A)	decibel (frequency-weighted to correspond to human hearing)
DCD	Deseret Chemical Depot (in Utah)
DDESB	Department of Defense Explosives Safety Board

DEM	digital elevation model
DHHS	U.S. Department of Health and Human Services
DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DRE	destruction and removal efficiency
EA	environmental assessment
EDS	Explosive Destruction System
EDT	explosive destruction technology
EIS	environmental impact statement
EONC	enhanced on-site container (for transporting chemical munitions)
EPA	U.S. Environmental Protection Agency
°F	degrees Fahrenheit
FARS	Fatality Analysis and Reporting System
FEIS	final environmental impact statement
FMCSA	Federal Motor Carrier Safety Administration
FONSI	finding of no significant impact
FR	<i>Federal Register</i>
ft	foot (or feet)
ft ³	cubic foot (or cubic feet)
FWS	U.S. Fish and Wildlife Service
g	gram
gal	gallon
GB	a chemical nerve agent, also called “sarin”
GCRP	U.S. Global Change Research Program
GHG	greenhouse gas
H	a chemical vesicant/blister agent, also called Levenstein mustard
HAP	hazardous air pollutant
HD	a chemical vesicant/blister agent, also called “distilled mustard”
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
hr	hour
HVAC	heating, ventilation and air conditioning (system)
IBD	inhabited building distance
ILD	intraline distance
in.	inch

°K	degrees Kelvin
KDEP	Kentucky Department for Environmental Protection
kg	kilogram (thousands of grams)
KPDES	Kentucky Pollutant Discharge Elimination System
kW	kilowatt (thousands of watts)
KYDAQ	Kentucky Division of Air Quality
lb	pound
LOS	level of service
m	meter
m ³	cubic meter
MEA	monoethanolamine
mg	milligram (one thousandth of a gram)
min	minute
mm	millimeter (one thousandth of a meter)
MPT	metal parts treater
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NEW	net explosive weight
NO ₂	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRC	National Research Council
O ₃	ozone
OTS	off-gas treatment system
PAED	public access exclusion distance
PAS	pollution abatement system
Pb	lead (the element)
PCB	polychlorinated biphenyl
PEOACWA	Program Executive Office, Assembled Chemical Weapons Alternatives
PM ₁₀	particulate matter with a diameter equal to or less than 10 µm
PM _{2.5}	particulate matter with a diameter equal to or less than 2.5 µm
PMCD	Program Manager for Chemical Demilitarization (a predecessor of the U.S. Army Chemical Materials Agency)
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million

PSD	prevention of significant deterioration
psi	pounds per square inch
PTD	public transportation distance
RCRA	Resource Conservation and Recovery Act
RFP	request for proposal
ROD	Record of Decision
s	second
SCWO	supercritical water oxidation
SDC	Static Detonation Chamber
SLERA	screening-level ecological risk assessment
SLHHRA	screening-level human health risk assessment
SO ₂	sulfur dioxide
SPSS	Site Plan Safety Submission
SWPPP	Storm Water Pollution Prevention Plan
TDC	Transportable Detonation Chamber
TOCDF	Tooele Chemical Agent Disposal Facility
TSDF	treatment, storage, and disposal facility
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USGS	U.S. Geological Survey
VOC	volatile organic compound
VMT	vehicle miles traveled
VSL	vapor screening level
VX	a chemical nerve agent
WPL	worker population limit
yr	year

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EXECUTIVE SUMMARY

The Blue Grass Army Depot (BGAD) in Kentucky currently stores a stockpile of chemical munitions consisting of rockets and projectiles filled with either a nerve agent or a blister agent (i.e., H agent, which is also called mustard agent). The destruction of the entire United States (U.S.) stockpile of chemical weapons that contain lethal, unitary chemical agents is required by U.S. public law and by an international treaty. The U.S. Army is in the process of completing the destruction of this chemical weapons stockpile at the depots where the agents and munitions are stored, including the BGAD.

The current plan to accomplish the demilitarization of the BGAD chemical munitions stockpile involves the use of the Blue Grass Chemical Agent-Destruction Pilot Plant (BGCAPP), which is expected to become operational in 2019 and which would employ chemical neutralization processes to destroy the chemical agents after they have been drained from the munitions. However, not all of the munitions in storage at the BGAD are anticipated to be suitable for processing at the BGCAPP. This includes the entire inventory of 15,492 mustard-filled munitions (i.e., 155mm projectiles) and two 3-gallon containers [also called Department of Transportation (DOT) bottles] of mustard agent that are currently in storage at the BGAD. These munitions compose approximately 15 percent of the BGAD inventory of chemical munitions.

The condition of some of the BGAD mustard-filled munitions would prevent them from being safely and efficiently disassembled to provide adequate access to the mustard agent prior to the destruction of that agent in the BGCAPP. Because this condition may not be confirmed until the munitions undergo preparation for processing operations at the BGCAPP, such munitions would be categorized as “rejects” because they could not be processed at the BGCAPP.

The proposed action addressed in this Environmental Assessment (EA) is to deploy and operate specialized Explosive Destruction Technology (EDT) equipment for the safe and timely destruction of the mustard-filled 155mm projectiles and DOT bottles currently being stored at the BGAD in an environmentally acceptable and cost-effective manner. The Army proposes to construct and operate an EDT facility within the boundaries of the BGAD to augment the planned operation of the BGCAPP and to address the issues expected to be encountered during the processing of the mustard-filled munitions.

Three separate commercial vendors can each provide EDT systems capable of destroying the BGAD inventory of mustard-filled munitions. These commercial systems include the Static Detonation Chamber (SDC), the Transportable Detonation Chamber (TDC), and the Detonation of Ammunition in Vacuum Integrated Chamber (DAVINCH).

The U.S. Army also currently possesses and operates an Explosive Destruction System (EDS) that can accomplish the proposed action.

An assessment of the potential environmental impacts of constructing and operating an EDT facility using one of the above four EDT systems is the subject of this EA. However, it is not the intent of this EA to identify or select the “best” type of EDT system from the above list. Rather, this EA assesses the potential environmental impacts for a proposed EDT facility that would be operated with any of the four EDT systems. If a decision is made to proceed with the proposed action, there are other programs within the Army—including those that consider costs, logistics, scheduling, permitting, and other economic factors—that will be used to make a final choice of which type of EDT system will be selected for implementation.

The analyses in this EA consider and evaluate the potential environmental impacts upon the following resource categories: land use, air quality, surface water resources, groundwater resources, human health and safety, aquatic ecological resources, terrestrial ecological resources, socioeconomic resources, aesthetics, cultural resources, environmental justice, noise, waste management, transportation of wastes, resource requirements, and decommissioning and closure.

The information and analyses presented in this EA indicate that the proposed action of constructing and operating an EDT facility at the BGAD for the destruction of the mustard-filled 155mm projectiles and DOT bottles would produce no significant environmental impacts. This finding applies to an EDT facility that incorporates any of the four types of EDT systems evaluated in this EA: the SDC, the TDC, the DAVINCH, or the EDS.

An assessment of the no-action alternative (i.e., the processing of the problematic mustard-filled munitions and DOT bottles in the BGCAPP) also indicates that no significant environmental impacts would occur; however, the no-action alternative would require modifications to the current BGCAPP design to handle the problems expected to be encountered during the processing of the mustard-filled “rejects.” Some of these design changes are anticipated to involve processing steps that would require manual intervention by workers wearing the appropriate personal protective equipment. The modifications to the BGCAPP would introduce potential safety, programmatic, and environmental risks because of the need to modify, develop, or construct new processes, facilities, and handling procedures for the problematic mustard-filled 155mm projectiles currently being stored at the BGAD.

It should be noted that the implementation of the proposed EDT facility (i.e., the proposed action) to process the entire BGAD inventory of mustard-filled 155mm projectiles and DOT bottles would completely eliminate the need for a design modification to the BGCAPP to handle any mustard-filled munitions and would also completely eliminate the

need for any mustard campaign whatsoever at the BGCAPP (because the 155mm projectiles and DOT bottles contain the total inventory of mustard agent at the BGAD). Under the proposed action, the mission of the BGCAPP could therefore focus solely on the campaigns to destroy two chemical warfare agents (i.e., the nerve agents GB and VX) instead of three.

Based on the lack of significant adverse environmental effects, it is concluded that the most desirable course of action would be to proceed with the construction of an EDT facility that incorporates any one of the four types of EDT systems (i.e., the SDC, the TDC, the DAVINCH, or the EDS) and to operate this new EDT facility so as to complete the destruction of the mustard-filled 155mm projectiles and DOT bottles currently stored at the BGAD.

As described in detail in this EA, the proposed action would create no significant impacts. This finding applies to the construction, operation, and decommissioning/closure of an EDT facility using any one of the commercial types of EDT systems (i.e., the SDC, the TDC, or the DAVINCH) at the proposed location at the southwest corner of the BGCAPP footprint or using the U.S. Army-owned EDS located at the alternate site just to the north of the BGCAPP.

A draft finding of no significant impact (FONSI) indicating the above conclusion has been prepared and will be issued for public review and comment simultaneous with the public review period for this Final EA.

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1. INTRODUCTION

The destruction of the entire United States (U.S.) stockpile of chemical weapons that contain lethal, unitary chemical agents is required by U.S. Congressional directives (see Public Law 99-145, et seq., and Section 8119 of Public Law 110-116) and by an international treaty known as the Chemical Weapons Convention (CWC) (OPCW 2005). The U.S. Army is in the process of completing the destruction of this chemical weapons stockpile at the depots where the agents and munitions are stored. This Environmental Assessment (EA) addresses the proposed destruction of all mustard-agent-filled containers and munitions, including problematic munitions (defined hereinafter as “overpacked munitions” and “rejects,” see Sections 1.1.1 and 1.1.2, respectively, for details), currently stored at the Army’s Blue Grass Army Depot (BGAD) near Richmond, Kentucky. These mustard-agent-filled containers and munitions compose approximately 15 percent of the chemical weapons stored at the BGAD.

The Army proposes to deploy and operate specialized equipment that uses explosive destruction technology (EDT) for the safe and timely destruction of the BGAD’s entire inventory of mustard-agent-filled munitions and containers. This equipment would be constructed as part of a new EDT facility to be built at the BGAD. As explained in greater detail in Section 2.1.1, four such EDT systems are under consideration in this EA. Three separate commercial vendors can each provide EDT systems capable of destroying the mustard-filled munitions and containers that are being stored at the BGAD. These three commercial systems include the Static Detonation Chamber (SDC), the Transportable Detonation Chamber (TDC), and the Detonation of Ammunition in Vacuum Integrated Chamber (DAVINCH) system. The U.S. Army also currently possesses and operates a fourth system, the Explosive Destruction System (EDS), which can accomplish the proposed action.

This EA provides information to be considered in making a decision regarding the proposed action and its alternatives by documenting the potential environmental consequences. The intent is to obtain public input and comment on the proposed action and the draft finding of no significant impact (FONSI) so as to provide the Army’s decision makers with the necessary information to support informed decisions regarding an environmentally sound path forward to destroy the BGAD’s inventory of mustard-agent-filled containers and munitions. Because this EA concludes with a recommendation for a FONSI, the Army has simultaneously issued a draft FONSI and is seeking public comment on the draft FONSI during the same comment period as for this EA.

This chapter presents background information about the agents and munitions in storage at the BGAD (see Section 1.1) and provides a brief overview of the Army’s proposed

action (Section 1.2), as well as a discussion of the purpose and need for the proposed action (Section 1.3). This chapter also discusses the scope (i.e., legal framework and approach taken) for the environmental review conducted in this EA (Section 1.4). Public participation is discussed in Section 1.5.

1.1 BACKGROUND

1.1.1 The BGAD Inventory of Mustard-Filled Munitions

Over 101,000 chemical munitions—filled with a combined total of over 520 tons of chemical warfare agents (DOD 1996a)—are currently being stored at the BGAD by the Blue Grass Chemical Activity (BGCA), which is a tenant activity at the BGAD. The chemical agents stored at the BGAD include nerve agents (designated as one of two types: either GB agent or VX agent) and vesicant/blister agent (designated as H agent, which is also called mustard agent). As shown in Table 1-1, the chemical munitions currently stored at the BGAD include 115mm rockets filled with either GB agent or VX agent, 8-in. projectiles filled with GB agent, 155mm projectiles filled with VX agent, and mustard-agent-filled 155mm projectiles. The table also provides the percentage of the total inventory for the

Table 1-1. The BGAD Chemical Weapons Inventory.

Munition Type/Model	Chemical Agent Fill	Percent of BGAD Inventory
155mm projectile, M110	H	15%
Container (DOT bottle)	H	< 0.05%
8-in. projectile, M426	GB	4%
115mm rocket, M55	GB	51%
115mm rocket warhead, M56	GB	< 0.05%
155mm projectile, M121/A1	VX	13%
115mm rocket, M55	VX	17%
115mm rocket warhead, M56	VX	< 0.05%
Container (DOT bottle)	VX	< 0.05%

Source: “U.S. Chemical Weapons Stockpile Information Declassified,” Press Release No. 024-96, Office of the Assistant Secretary of Defense (Public Affairs), U.S. Department of Defense, Washington, D.C., January 22, 1996.

numbers of each type of item in storage at the BGAD. The mustard-filled 155mm projectiles (see Figure 1-1) and containers [which consist of standard Department of Transportation (DOT) 3A bottles] (see Figure 1-2) are the subject of this EA.

The mustard agent in storage at the BGAD was manufactured between 1941 and 1943 at the Edgewood Area of the Aberdeen Proving Ground in Maryland. This agent was subsequently used to fill the 155mm projectiles in the 1940s, and the projectiles have been in storage at the BGAD since that time. Most of the munitions are in good condition, but a few have developed leaks. All of the leaking items have been placed inside overpack containers and are stored separately from stockpile munitions. Stockpile munitions are monitored through a regular inspection program. Less than 200 individually overpacked 155mm projectiles are currently stored at the BGAD. As described in Section 1.2, a total of 15,492 mustard-filled projectiles, including the overpacked munitions (i.e., the entire BGAD inventory of mustard-filled munitions), would be destroyed under this proposed action.

The 155mm projectiles being stored at the BGAD include an explosive burster (see Figure 1-1) that is used to disperse the chemical agent when the round is fired and hits its target. All of the bursters (also called “explosive components” in this EA) associated with the 155mm projectiles would also be destroyed under this proposed action.

The two mustard-filled DOT bottles being stored at the BGAD do not include any explosive components. These standard DOT 3A bottles contain H-agent stockpile-derived samples. Each cylindrical bottle has a diameter of about 7 in., and it is approximately 25 in. tall. While each DOT 3A bottle has a capacity of up to 3 gal, neither of the two bottles at the BGAD contains more than 1.5 gal of mustard agent.

Previous destruction activities with mustard-filled munitions at other Army depots have uncovered problems in regard to (1) internal corrosion and (2) the physical state of the mustard agent inside the munitions. These two issues are described in the following paragraphs.

During chemical munitions destruction activities at the Army’s Tooele Chemical Agent Disposal Facility (TOCDF) in Utah, mustard-filled projectiles similar to those in the BGAD stockpile were processed. The bursters were found to be corroded and could not be easily removed from the projectiles’ burster wells. The designs incorporated into the Army’s chemical agent destruction facilities require access to and draining of the chemical agent from the munitions prior to the subsequent destruction of that agent. The removal of the burster is therefore an essential part of the process for accessing and draining the agent. The “stuck bursters” at the TOCDF required unanticipated manual intervention—via workers wearing personal protective equipment (PPE)—as well as additional force to successfully remove the bursters. Because similar production lots of projectiles are in the storage inventory at the BGAD, the Army expects to encounter similar difficulties in being able to remove the bursters and subsequently drain the mustard agent from inside the projectiles.

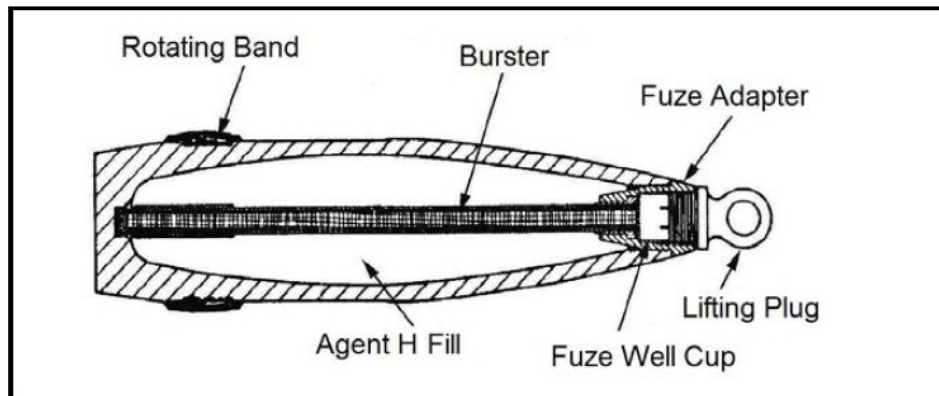


Figure 1-1. Schematic Illustration of the M110, 155mm (refers to the nominal diameter of the projectile) Artillery Projectile Stored at the Blue Grass Army Depot.



Figure 1-2. Photograph of a Standard DOT 3A Bottle Such as the Type Used to Store Mustard Agent at the Blue Grass Army Depot.

In addition, many of the mustard-filled munitions processed at other depots have been found to contain a significant quantity of undrainable “heels”¹ which consist of sludge-like solid materials. The existence of such heels presents challenges with the processing of the agent for destruction, because the processing would first require the agent to be fully drained from the munition before being subjected to subsequent destruction processes, such as chemical neutralization.

In order to determine the state of the mustard agent inventory at the BGAD, a non-intrusive X-ray examination was conducted in May and June 2011 on a representative sample of the mustard-filled 155mm projectiles from the BGAD stockpile. A total of 96 projectiles were taken from selected locations within the existing storage igloos, and 80 overpacked munitions were also selected for examination. The findings, as follows, are reported in the Army’s X-ray assessment report (CMA 2011). All of the 96 projectiles contained heels. The amount of the smallest observed heel was approximately 15 percent of the munition’s agent content, while the average amount of heel was determined to be about 55 percent. The mustard agent inside some of the munitions was found to be completely solidified. On average, more than half of the fill material in the X-rayed munitions was found to have been converted into or trapped within a heel. Evaluation of the heel data from storage igloo to storage igloo and also from location to location within a storage igloo, as well as by lot number (i.e., mustard agent manufactured in the same production batch), did not reveal any statistically significant patterns in regard to either the presence or quantity of the heels. Approximately 45 percent of the 80 overpacked munitions were found to have liquid agent outside the munition cavity, and 2.5 percent had heel outside the cavity, thus confirming the necessity of placing these munitions inside leaker overpacks.

Based upon the statistics obtained during the X-ray assessment of the 96 stockpile munitions, it is estimated that approximately 3000 of the 155mm projectiles in the BGAD inventory have between 50 and 59 percent heel, and approximately 6100 have heels greater than 59 percent of the munition’s content (CMA 2011). These numbers infer that heels in excess of 50 percent would be encountered in over half of the BGAD’s 15,492 mustard-filled 155mm projectiles, and all of the 15,492 projectiles would be expected to contain some quantity of undrainable heel (with 15 percent of the munition’s agent content being the smallest amount of heel observed during the X-ray assessment).

Previous destruction activities involving mustard-filled munitions at other Army depots have indicated the potential for arsenic and/or mercury contamination to be present in mustard agents. This contamination has been traced to the re-distillation process specific to

¹ “Heels” are the leftover portion of mustard agent that remains inside the projectile after the agent-draining operations are completed. Because mustard agent can sometimes solidify or can develop sludge-like residues after prolonged periods of storage, the “heel” therefore represents the portion of the agent inside a projectile that cannot be completely drained.

HD mustard agent (i.e., a different type of mustard agent than the H agent in storage at the BGAD) that was used at the Rocky Mountain Arsenal in Colorado and stored in containers that previously contained lewisite (i.e., an arsenic-based chemical warfare agent). The mercury and arsenic concentrations in the H mustard agent at the BGAD are not expected to be as high as the concentrations reported for HD mustard agent at the other depots. There is limited data available on the concentrations of these metals in the BGAD inventory of mustard agent; however, existing data indicate a mercury concentration of approximately 0.5 mg/kg in both the liquid and solid heel, and an arsenic concentration of approximately 6.3 mg/kg in the liquid and 77.0 mg/kg in the solid heel. The human health risk assessment that has been conducted for the proposed EDT facility (see Section 3.1.3.1) includes consideration of both arsenic and mercury emissions from the proposed facility.

1.1.2 The Present Situation at the BGAD

In 2002, the Army completed an environmental review and issued a Final Environmental Impact Statement (FEIS) for the destruction of the entire BGAD inventory of chemical agents and munitions (PMCD 2002). The Army's Record of Decision (ROD) for the 2002 FEIS identified a non-incineration process as the preferred method for completing the destruction of the BGAD stockpile [68 *Federal Register* (FR) 10705–6]. The ROD stated that the BGAD facility would be constructed and then operated as a pilot plant before beginning full-scale operations (Fatz 2003).

The Blue Grass Chemical Agent-Destruction Pilot Plant (BGCAPP) is being constructed at the BGAD under the oversight of the Program Executive Office, Assembled Chemical Weapons Alternatives (PEOACWA). Mechanical construction activities, including excavation and earth-moving, at the BGCAPP are scheduled for completion by August 2016. The PEOACWA is the proponent for this EA. The PEOACWA also has the responsibility for the destruction of the chemical weapons stockpile at the BGAD.

The mission of the BGCAPP, which is expected to become operational in February 2019, is to pilot test a technology capable of destroying the stockpile of chemical warfare agents stored at the BGAD. The BGCAPP would employ chemical neutralization processes followed by supercritical water oxidation (SCWO) to destroy these chemical agents after they have been drained from the munitions; however, as discussed in Section 1.1.1, not all of the mustard munitions in storage at the BGAD are anticipated to be suitable for processing at the BGCAPP. That is, the condition of the mustard-filled 155mm projectiles with either stuck bursters or solidified heels would prevent them from being efficiently disassembled to provide adequate access to the mustard agent prior to the draining of that agent and its destruction in the BGCAPP. Because this condition may not be confirmed until the munitions undergo preparation for processing operations at the BGCAPP, such munitions

would be categorized as “rejects” since they could not be processed at the BGCAPP. Furthermore, any additional leaking munitions (i.e., beyond the number of mustard-filled munitions presently stored in overpack containers at the BGAD) encountered during processing operations at the BGCAPP would also be categorized as “rejects.” A considerable number of modifications (as described in Section 2.2), including the addition of manually operated processing steps, would need to be made to the current BGCAPP design in order to accommodate the processing of “rejects.”

As discussed in Section 1.1.1, most—if not all—of the mustard-filled 155mm projectiles in storage at the BGAD are likely to become “rejects” due to the anticipated presence of solidified heels. For this reason, an alternative to processing through the BGCAPP has been identified as the proposed action in this EA. The entire BGAD inventory of all 15,492 mustard-filled 155mm projectiles (including approximately 200 overpacked items), plus the two mustard-filled DOT bottles, would be destroyed under the proposed action described in Section 1.2.

1.2 OVERVIEW OF THE PROPOSED ACTION

This section provides a brief overview of the proposed action that is addressed in this EA. Additional, more detailed information about the specifics of the proposed action and its alternatives can be found in Section 2.

The proposed action is to deploy and operate specialized EDT equipment for the safe and timely destruction of the mustard-filled chemical munitions (i.e., 155mm projectiles) and DOT bottles currently being stored at the BGAD in an environmentally acceptable and cost-effective manner. The Army proposes to construct and operate an EDT facility within the boundaries of the BGAD to augment the planned operation of the BGCAPP and to address the issues expected to be encountered during the processing of the mustard-filled munitions.

Before the first nerve-agent operations begin at the BGCAPP, it is planned that the proposed EDT facility would process all of the mustard-filled items. It is not desirable from the standpoints of logistics or resource and operational efficiency to process different types of chemical agents simultaneously. Based on current schedule estimates, a 38-week period of operation for the proposed EDT facility would allow enough time between the processing of agent types to facilitate the overall schedule for the destruction of the entire BGAD stockpile. It is therefore envisioned that the mission and use of the proposed EDT facility to destroy the mustard-filled projectiles and the two mustard-filled DOT bottles would be completed before operations begin at the BGCAPP; nevertheless, the possibility does exist for the overlapping, simultaneous operation of the two facilities.

The four types of EDT units under consideration each consist of a thick-walled steel detonation chamber into which the mustard-filled munitions (in their as-is condition, containing their installed explosive components) would be placed. After placement, the detonation chamber would be closed and tightly sealed. Each type of EDT unit has the associated equipment that is necessary to destroy the chemical munitions and explosive components inside either through the use of donor explosives, shaped charges followed by neutralization, or direct heating. The by-products of the mustard-destruction reactions inside the chamber would either be tested for their hazardous characteristics prior to the opening of the chamber or would otherwise be routed into an off-gas treatment system (OTS) where additional destruction processes would occur. Each of the EDT systems has its own OTS for handling the gaseous by-products generated by the EDT unit. The solid and liquid wastes from the detonation chamber would be disposed of in a manner consistent with their hazardous characteristics.

During the 38-week operational lifetime of the proposed EDT facility, each of the four types of EDT units being considered under the proposed action in this EA must be capable of processing the entire BGAD inventory of mustard-filled 155mm projectiles and DOT bottles. The proposed EDT facility would consist of only a single type of EDT unit; however, multiple units of that same type might be deployed. Consideration of the throughput rates of each type of EDT unit has been used to estimate the number of each type of unit that would be needed if only that single type of unit were to be used in the proposed EDT facility: one SDC unit, two TDC units, two DAVINCH units, or seven EDS units.

1.3 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to provide for the destruction of the mustard-filled munitions (i.e., 155mm projectiles) and containers (i.e., two DOT bottles) that are currently being stored at the BGAD. The equipment designed and undergoing fabrication for installation at the BGCAPP will not be able to accomplish the draining of the mustard agent from the problematic munitions due to overpacked leaking rounds, stuck bursters, or solidified mustard agent as described in Section 1.1.1. Surveillance studies have proven a high probability that these problematic munitions exist in the BGAD stockpile. Unless the mustard agent can be successfully accessed, drained, and fully removed from the munitions, the BGCAPP cannot complete the destruction of the mustard agent through its chemical neutralization processes. The proposed action would thus provide a solution for the processing and destruction of the mustard-filled munitions at the BGAD without the need to design, install, and conduct prove-out tests on any modifications to the BGCAPP design.

The proposed action is needed to show progress toward meeting U.S. obligations under the international CWC (OPCW 2005) and U.S. public laws (see Public Law 99-145, et seq., and Section 8119 of Public Law 110-116) regarding the destruction of the entire U.S. stockpile of lethal, unitary chemical warfare agents. In addition, the completion of the proposed action, in conjunction with the completion of operations at the BGCAPP, would eliminate the need for continued surveillance and maintenance of the mustard agents and munitions currently being stored at the BGAD.

1.4 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

1.4.1 Framework

This EA has been prepared by the PEOACWA to evaluate the significance of the potential environmental impacts of the construction and operation of an EDT facility at the BGAD to accomplish the destruction of mustard-filled munitions and DOT bottles. This EA has been prepared in accord with Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of the National Environmental Policy Act (NEPA) of 1969 [40 *Code of Federal Regulations* (CFR) Parts 1500–1508], Department of Defense (DOD) Directive 4715.9 on *Environmental Planning and Analysis* (DOD 1996b), Army Regulation (AR) 200-1 on *Environmental Protection and Enhancement* (DA 2007), and AR 200-2 on *Environmental Analysis of Army Actions* (32 CFR Part 651). Under these procedures, the Army must consider the environmental consequences of its proposed actions.

The potential environmental impacts associated with the destruction of the entire BGAD inventory of chemical weapons, including the mustard-filled munitions, have been previously addressed in the 2002 FEIS (PMCD 2002). The FEIS concluded that the operation of a chemical weapons destruction facility (such as what is now called the BGCAPP) would not result in any significant adverse environmental impacts; however, the 2002 FEIS did not specifically address potential impacts associated with the destruction of the leaking, overpacked, or other “reject” munitions—or the two mustard-filled DOT bottles—as contemplated under the proposed action in this EA.

The potential environmental impacts of constructing and operating an EDT facility at the BGAD are evaluated in Section 3 of this EA, including those impacts associated with land use, air quality, water resources, human health and safety, ecological resources, socioeconomic resources, environmental justice, noise, waste management, and resource consumption. To avoid redundancy and to comply with the intent of CEQ guidance at 40 CFR 1500.4 on reducing paperwork, this EA tiers from and relies upon the findings of the Army’s previous assessment of the destruction of mustard agents and munitions at the

BGAD in the 2002 FEIS (PMCD 2002) where appropriate, rather than presenting new analyses. In addition, the following previous assessments have been reviewed and incorporated by reference into the analyses in Section 3 of this EA:

- *Final Environmental Impact Statement for the Design, Construction and Operation of One or More Pilot Test Facilities for Assembled Chemical Weapons Destruction Technologies at One or More Sites* (ACWA 2002)
- *Environmental Assessment for the Proposed Installation and Operation of the Pine Bluff Explosive Destruction System (PBEDS) at Pine Bluff Arsenal, Arkansas* (CMA 2004)
- *Environmental Assessment for Siting of the Blue Grass Chemical Agent-Destruction Pilot Plant and Associated Access Road, Parking Areas and Utilities at the Blue Grass Army Depot* (USACE 2004)
- *Environmental Assessment for Proposed Borrow Area for the Blue Grass Chemical Agent-Destruction Pilot Plant at the Blue Grass Army Depot* (USACE 2005)
- *Environmental Assessment for the Proposed Destruction of Recovered Chemical Munitions at Schofield Barracks, O'ahu, Hawai'i* (CMA 2008a)
- *Environmental Assessment for the Proposed Installation and Operation of an Explosive Destruction Technology at the Anniston Army Depot, Anniston, Alabama* (ANCDF 2009)
- *Supplemental Environmental Assessment and Finding of No Significant Impact for the Siting of the Blue Grass Chemical Agent-Destruction Pilot Plant and Associated Access Road, Parking Areas and Utilities at the Blue Grass Army Depot* (USACE 2011)
- *Proposed Installation and Operation of an Explosive Destruction Technology Facility at the Pueblo Chemical Depot* (USAE/ACWA 2012)

References to the above previous assessments are included in Section 3, as necessary, to support the analyses of potential environmental impacts. Where a simple comparison between the findings of these previous assessments and the current proposed action is not sufficient to determine the relative magnitude or significance of the potential impacts, additional analysis is presented in Section 3 of this EA.

Specific details on each of the four EDT systems evaluated in this EA can be found in Section 2.1.1. Three separate commercial vendors can each provide EDT systems capable of destroying the mustard-filled munitions at the BGAD. These commercial systems include the SDC unit, the TDC unit, and the DAVINCH unit. The U.S. Army also currently possesses and operates an EDS unit that can accomplish the proposed action.

The above four EDT systems are the subject of this EA; however, it is not the intention of this EA to identify or select the “best” type of system from the above list. Rather,

this EA assesses the potential environmental impacts for a proposed EDT facility that would be operated with any one of these four EDT systems. Where significant differences do exist among the four EDT systems in regard to their potential to create environmental impacts, Section 3 of this EA identifies and discusses such differences in detail. Where no such differences exist, this EA states that finding as well. If a decision is made to proceed with the proposed action, there are other programs within the Army—including those that consider costs, logistics, scheduling, permitting, and other economic factors—that will be used to make a final choice of which EDT unit will be selected for implementation.

In accord with CEQ regulations and 32 CFR Part 651, this EA includes an assessment of the no-action alternative, which is defined as the processing and destruction of the BGAD inventory of mustard-filled munitions and DOT bottles in the BGCAPP, even though this alternative would require significant modifications to the current BGCAPP design to accommodate the aforementioned, anticipated problems with stuck bursters and/or solidified mustard agent inside the 155mm projectiles.

While NEPA documents often include discussions of technology-related and regulatory issues, such documents are required to be prepared early in the planning process and, therefore, rarely contain design information sufficiently detailed for use with the various permits required by other regulations and statutes. Nevertheless, regulatory compliance for the proposed action will require the Army to submit a comprehensive, detailed description of the destruction technology selected and the proposed pollution control measures as part of its applications for permits to be issued pursuant to the Resource Conservation and Recovery Act (RCRA), the Clean Air Act (CAA), the Federal Water Pollution Control Act, and other applicable laws and regulations. Thus, separate regulatory documentation beyond the scope of this EA will be prepared, as necessary, independent of the NEPA review process. Some of these other regulatory and permitting processes also include public meetings to discuss pertinent environmental issues.

1.4.2 Approach

This EA identifies, documents, and evaluates the potential effects of construction, operation, and closure of an EDT facility for the destruction of the mustard-filled munitions and DOT bottles that are currently stored at the BGAD. An interdisciplinary team of environmental scientists and analysts has performed the impact analyses. The team has identified resources and topical areas, incorporated information from the previous environmental reviews of EDT activities, analyzed the proposed action against the existing conditions, and determined the relevant beneficial and adverse effects associated with the proposed action.

Section 3 of this EA describes the existing conditions of the potentially affected resources and other areas of special interest within the boundaries of the BGAD or in the vicinity of the BGAD. The region of potential impact consists exclusively of Madison County, Kentucky, in which the BGAD is located. The existing conditions described in Section 3 constitute the basis for the assessment of potential effects of implementing the proposed action at the BGAD as detailed in Section 2. The potential effects of the proposed action are also described in Section 3. Mitigation measures that could reduce either the likelihood or severity of adverse impacts are identified where appropriate.

This EA analyzes direct impacts (i.e., those caused by or directly associated with implementation of the proposed action and occurring at the same time and place), as well as indirect impacts (i.e., those caused by implementation of the proposed action and occurring later in time or farther removed in distance, but still reasonably foreseeable). Cumulative effects (i.e., those resulting from the incremental impacts of the proposed action when added to other past, present, and future actions regardless of what agency, organization, or person undertakes such other actions) are also addressed. Cumulative effects include those that might result from individually minor, but collectively significant, actions taken over a period of time.

For the purpose of assessing potential cumulative impacts in this EA, it is assumed that the BGCAPP and the proposed EDT facility would both be in operation at the same time.

1.5 PUBLIC PARTICIPATION

Public involvement is an integral component of the Army's plans to complete the destruction of the entire BGAD stockpile of mustard-filled munitions and DOT bottles. This EA and its accompanying draft FONSI have a public comment period of 30 days. The Army invites and welcomes public comments and participation in the NEPA process. The BGAD and PEOACWA outreach teams have been supportive of public participation and the sharing of information related to the demilitarization objectives for the BGAD stockpile. Outreach efforts for this EA will be conducted as part of the NEPA review and will be consistent with PEOACWA policy.

The public involvement strategy to disseminate information and invite stakeholder input on the proposed action addressed in this EA incorporates the following tools: (1) community forums or special presentations, technology overviews, or site visits, as determined in cooperation with the Kentucky Chemical Demilitarization Citizens' Advisory Commission (CAC); (2) on-going communication opportunities through the CAC and its Chemical Destruction Community Advisory Board (CDCAB); (3) local publication and

availability of this EA for public comment; and (4) full utilization of public outreach assets in the distribution of this EA, collection of feedback, and support of all public meetings. In addition to the environmental review documented in this EA, additional environmental permits will be required for construction and operation of any EDT technology. Public participation would be part of the environmental permitting processes.

The public will be provided a period of 30 days to submit comments to the Army on this Final EA. Because this EA concludes with a recommendation for a FONSI, the Army has simultaneously issued a draft FONSI with the issuance of this Final EA and is seeking public comment on the draft FONSI during the same comment period as for the Final EA itself. After the close of the public comment period, the Army will consider all of the public comments received and will issue a final determination in regard to proceeding with the proposed action.

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2. THE PROPOSED ACTION AND ITS ALTERNATIVES

This section describes the proposed action, as well as the alternatives considered by the Army. Section 2.1 presents a detailed description of the proposed action—that is, the installation and operation of the proposed EDT equipment at the BGAD—and it provides technical information and data that serve as the basis for the assessment of the potential environmental impacts as presented in Section 3. Section 2.1 also includes a description of the resource requirements and the waste streams associated with the use of the proposed EDT equipment.

Section 2.2 discusses the no-action alternative; that is, not constructing or operating the proposed EDT facility at the BGAD. Section 2.3 identifies other alternatives that were considered.

2.1 THE PROPOSED ACTION

The Army proposes to construct and operate an EDT facility at the BGAD to augment the planned operation of the BGCAPP and to address the issues expected to be encountered during the processing of mustard-filled munitions as discussed in Sections 1.1.1 and 1.1.2. The proposed EDT facility would provide for the safe and timely destruction of the BGAD's inventory of mustard-filled munitions (i.e., 155mm projectiles) and containers (i.e., DOT bottles).

The proposed EDT facility would consist of only a single type of EDT unit (as described in detail in Section 2.1.1); however, multiple units of that type might be deployed. The destruction of the mustard agent in the proposed EDT facility would assist the Army in showing progress towards deadlines for the destruction of the U.S. stockpile of lethal, unitary chemical weapons as established by public law and international treaty.

As discussed in Section 1.4.1, the approach for the analyses undertaken in Section 3 of this EA is to examine each of the four types of EDT systems in the greatest possible detail, as if they were each to be separately constructed and operated as part of the proposed EDT facility. However, it is not the intent of this EA to identify or select the “best” system from among the four types of EDT systems evaluated in this EA. Rather, the analyses attempt to determine what potentially significant impacts, if any, are associated with the proposed EDT facility, regardless of which type of EDT system were to be used. The descriptions in this Section 2.1 serve as the basis for the analyses and determinations in Section 3 of this EA.

2.1.1 The Proposed EDT Facility and Its Associated Equipment

The construction period for the proposed EDT facility would depend upon which type of EDT unit were to be deployed; however, it is generally expected that construction would take approximately 27 months, beginning in mid-2014 and finishing in late-2016. EDT operations under the proposed action would begin after the operational readiness of the new facility has been demonstrated. Operation of the proposed EDT facility is expected to begin in mid-2017 with an operational lifetime of approximately 38 weeks. Upon the startup of the EDT facility, an initial shakedown period would be used to ramp the EDT unit to its full-capacity processing rate. Operations at the proposed EDT facility would be expected to be completed prior to the beginning of operations at the BGCAPP.

Transport and delivery of munitions to the proposed EDT facility would be provided by the use of munitions ammunition vehicles or enhanced on-site containers (EONCs) throughout the EDT operational period. Army and DOD safety and surety policies would be followed regarding the transportation/transfer from storage to the site of the EDT facility. Such deliveries would be conducted only during daylight hours on weekdays. Adequate munitions storage would be provided near the proposed EDT facility to allow continued operations on weekends and holidays.

Three separate commercial vendors can each provide EDT systems capable of destroying the mustard-filled munitions at the BGAD. These three commercial systems include the SDC, the TDC, and the DAVINCH units. The Army also currently possesses and operates an EDS that can accomplish the proposed action. In each system, the munitions are placed inside a specialized detonation chamber or containment vessel where the controlled destruction actions would occur. None of the EDT units require the disassembly of the munitions prior to being placed inside the chamber of the EDT unit. Each of the four types of EDT units uses one or a combination of the following three principles for destruction of chemical weapons (NRC 2009):

- **Thermal Destruction.** The SDC unit uses an electrically heated containment vessel (at approximately 1400°F) to heat the items above the auto-initiation temperature for the energetic materials. This results in their detonation, deflagration, or burning. Mustard agent released in this process is pyrolyzed by the detonation/deflagration and the temperatures that exist within the chamber.
- **Detonation Technology.** The TDC and DAVINCH units each destroy both the mustard agent and explosives in the munition by detonating donor explosives wrapped around the munition. The detonation process destroys both the mustard agent and the munition's explosive components.

- **Neutralization Technology.** The EDS unit uses small, shaped charges to open the munition and to detonate the explosive components in the burster. The mustard agent is destroyed by chemical neutralization reactions through the introduction of the appropriate liquid reagents into the chamber.

Each of the four EDT systems incorporates a capability that allows for the monitoring of the contents of the containment vessel prior to opening the chamber and removing the remnants of the destruction process. Approval of the EDT Site Plan Safety Submission (SPSS) document by the Department of Defense Explosives Safety Board (DDESB) is a prerequisite to operation of the selected EDT system. A destruction and removal efficiency (DRE) for the treatment of mustard agent-containing munitions at the BGAD has been established by the Kentucky Department for Environmental Protection (KDEP) as 99.9999 percent for operation of agent treatment units such as the EDT units.

A summary of the four types of EDT units under consideration is shown in Table 2-1. Even though the Army has identified four separate types of EDT units that could be employed to accomplish the proposed action, the Army plans to select a single EDT system for implementation under this proposed action. However, multiple units of that same type (for example, two TDC units) might be used during the operation of the proposed EDT facility. The required number of EDT units would be based on the ability of a system of such units to process the required feeds within the proposed EDT facility's 38-week operational period. Table 2-1 shows the estimated number of units that would be needed to accomplish the proposed action.

The following subsections describe each of the four types of EDT units in greater detail using data and information provided by each respective EDT vendor. Additional information about the equipment and emission parameters for each type of EDT unit can be found in Appendix A of this EA.

2.1.1.1 The Static Detonation Chamber (SDC) Unit

The SDC unit, from Dynasafe AB (a Swedish company), is an electrically heated explosive and chemical agent destruction system providing containment of blast effects and agent (NRC 2009). The nearly spherical, armored, double-shelled, high-alloy stainless steel detonation chamber (heated retort) is kept at approximately 1400°F to ensure reliable ignition of the explosives (see Figures 2-1 and 2-2). The SDC system has been operated in Münster, Germany, to treat more than 15,000 recovered chemical weapons, and it has been used in Anniston, Alabama, to process over 2700 mustard-filled stockpile chemical weapons. The electrically heated SDC unit is equipped with an OTS system that includes a thermal oxidation unit and pollution abatement system (PAS).

Table 2-1. Summary Comparison of EDT Systems for Use at the Blue Grass Army Depot.

Parameter	Name of EDT System or Unit			
	Static Detonation Chamber (SDC)	Transportable Detonation Chamber (TDC)	Detonation of Ammunition in Vacuum Integrated Chamber (DAVINCH)	Explosive Destruction System (EDS)
Type of System	To be fully constructed on site	Mobile unit	To be fully constructed on site	Transportable (truck-bed mounted)
Number of EDT units to be Deployed	1 unit	2 units	2 units	7 units
Land Area Required per EDT unit	Approximately 2.5 acres	Approximately 3 acres total for the two TDC units	Approximately 3 acres total for the two DAVINCH units	Approximately 10 acres total for the seven EDS units
Munition Detonation Method	Electrically heated	Donor charge	Donor charge	Shaped charge
Daily Emission Cycle per EDT unit (see Notes 1 and 2)	Continuous emissions during daily operational period	Batch process; 45 min between detonations (includes 15-min purge)	Batch process; 70 min between detonations (includes 15-min purge)	Batch process; Two detonations per day, each detonation produces two 10-min emissions releases and one 15-min purge
Chemical Reagents Required	None; Thermal oxidation unit ensures destruction	Additional oxygen added to chamber just prior to detonation	None; Cold-plasma oxidizer in exhaust gas stream ensures destruction	Monoethanolamine (MEA) added to chamber at end of treatment cycle

Notes:

- (1) With the exception of the EDS units as noted below, operations at the proposed EDT facility using any of the four types of EDT systems are assumed to occur 24 hours per day, seven days per week.
- (2) Each of the EDS units would be operated 24 hours per day, six days per week. One day each week would be devoted to maintenance activities for each of the EDS units.



Figure 2-1. The Static Detonation Chamber (SDC) Unit.

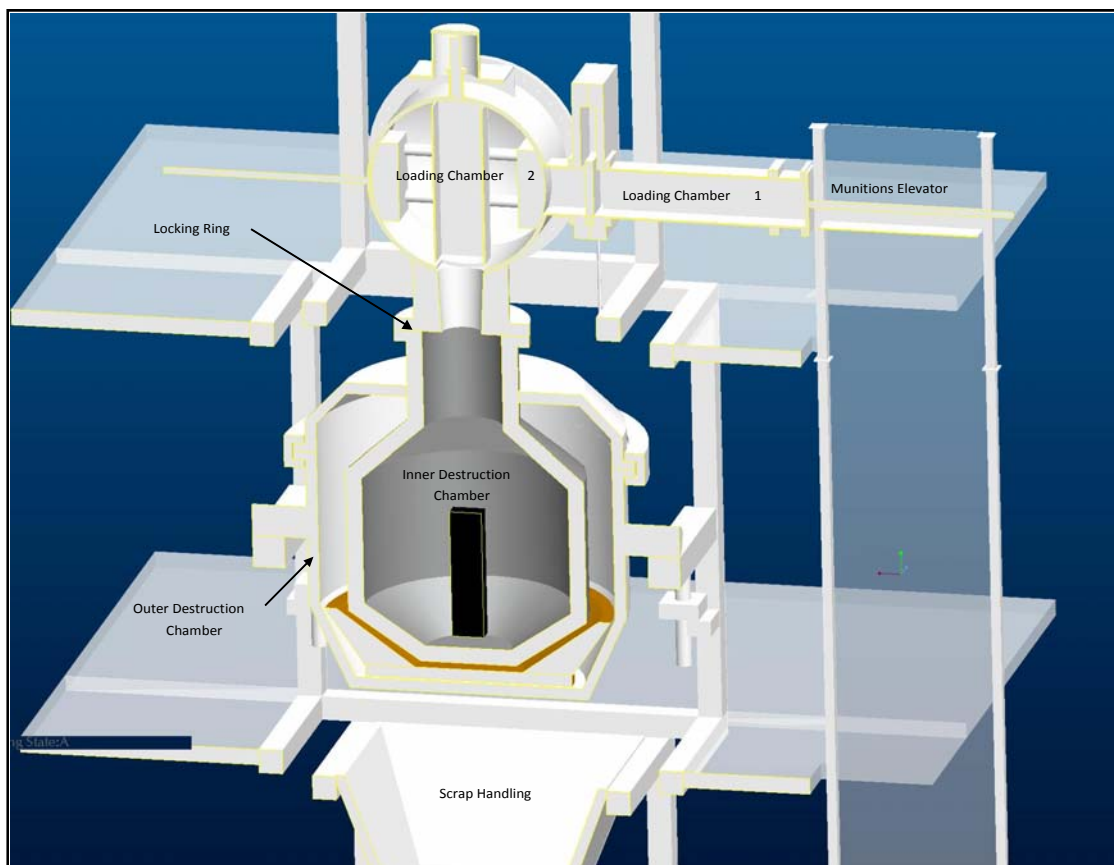


Figure 2-2. Diagram of the Static Detonation Chamber (SDC) Unit.

Intact chemical munitions are placed inside a cardboard or polypropylene box or disposable tray carrier, which is transported to the top of the SDC's detonation chamber. The boxed munitions are fed into the detonation chamber through two offset airlock-type loading chambers, each having its own door. That is, the system is interlocked so it is never open to the outside during operations. The intact munitions are dropped onto a heated bed of scrap metal, resulting in deflagration or detonation of the munitions' explosive components. The heat inside the chamber will then result in the thermal destruction of the mustard agent. No explosive donor charge is used, nor is any reagent needed to destroy the agent. If sufficient energy from the explosive components in the munitions is released, no additional external heating from the electrical resistance elements is required (NRC 2009).

The flue gas from the detonation chamber passes through the thermal oxidation unit to ensure agent destruction. The fragmented munition bodies are held in the chamber a sufficient amount of time to ensure they are free from explosive and/or agent contamination and are therefore suitable for being disposed of as scrap metal with no further treatment to allow them to be released from government control.

The OTS also includes a cyclone separator device for the removal of large particulates and a thermal oxidation unit (which uses natural gas as a fuel) that converts the pyrolysis gases to carbon dioxide and water. The thermal oxidation unit is followed by a PAS that provides a fast quench to minimize dioxin and furan formation. The PAS would consist of a spray dryer, acidic and neutral scrubbers, an adsorber/particulate filter system that uses a mixture of calcium oxides and carbonates with activated carbon, and a redundant-bed activated carbon filter prior to exhausting the by-product gases through the stack.

The SDC system has successfully demonstrated a DRE greater than 99.9999 percent for mustard agent and is presently in service at several international locations. The SDC system has previously been given DDESB approval for use at the Anniston Army Depot in Alabama to process selected problematic mustard-filled munitions, including 4.2-in. mortar rounds, 105mm projectiles, and 155mm projectiles (ANCDF 2009). Over 2700 mustard-filled munitions were successfully processed.

Previous experience with operations of the SDC unit has indicated that the scrap metal from the munition bodies and explosive components coming from the treatment unit would be recycled under the provisions of 40 CFR 260.30 that would classify these materials as not being solid waste.

If selected for deployment at the BGAD, only a single SDC unit would be installed as part of the proposed EDT facility. The supporting infrastructure for the SDC unit is described in Section 2.1.2.

2.1.1.2 The Transportable Detonation Chamber (TDC) Unit

The TDC unit, from CH2M-Hill, is a self-contained, enclosed system for the controlled detonation of chemical and conventional munitions. The TDC was originally developed in the United States, subsequently deployed for long-term operations in Belgium, and further refined through testing programs in the United Kingdom (NRC 2009).

The three main components of the TDC unit are a detonation chamber, an expansion chamber, and an emissions control system (see Figures 2-3 and 2-4). The TDC employs donor charges in the form of sheet, granular, or pre-formed explosives which are manually placed around the munitions or overpack containers by operator personnel. The munitions, which may or may not be in overpack containers, are placed into the detonation chamber



Figure 2-3. The Transportable Detonation Chamber (TDC) Unit.

using a jib crane. The TDC is configured with an operator-initiated, external firing system with positive feedback continuity checks, confirming the system is ready for detonation.

The floor of the chamber is covered with pea gravel, which absorbs some of the blast energy. Bags containing water are suspended near the munitions to help absorb blast energy and to produce steam, which reacts with the mustard agent vapors. Additional oxygen is added to the chamber just prior to the detonation to aid in the destruction process. An expansion chamber downstream of the detonation chamber is designed to control the sudden increase in pressure from the detonation. The system is designed with two flow control valves between the expansion tank and the OTS. These valves can be closed, which allows for detonation gases to be held in the expansion tank and tested.

In the OTS, a propane flame heats ambient air from outside the TDC system to an operating temperature of approximately 800°F. The mixture of heated ambient air, off-gases, and particulates from the detonation chamber is forced through a reactive bed filter consisting of dry solids, such as hydrated lime and/or sodium bicarbonate. The acid gases from the munitions destruction process then react with these dry solids, and particulates are removed by the filter elements. A precious-metal catalytic oxidation unit subsequently oxidizes any hydrogen and carbon monoxide in the gas stream into water and carbon dioxide, respectively. A two-stage carbon filtration system captures any trace organic compounds that might not have been destroyed in the oxidizer. The treated off-gases are discharged from the

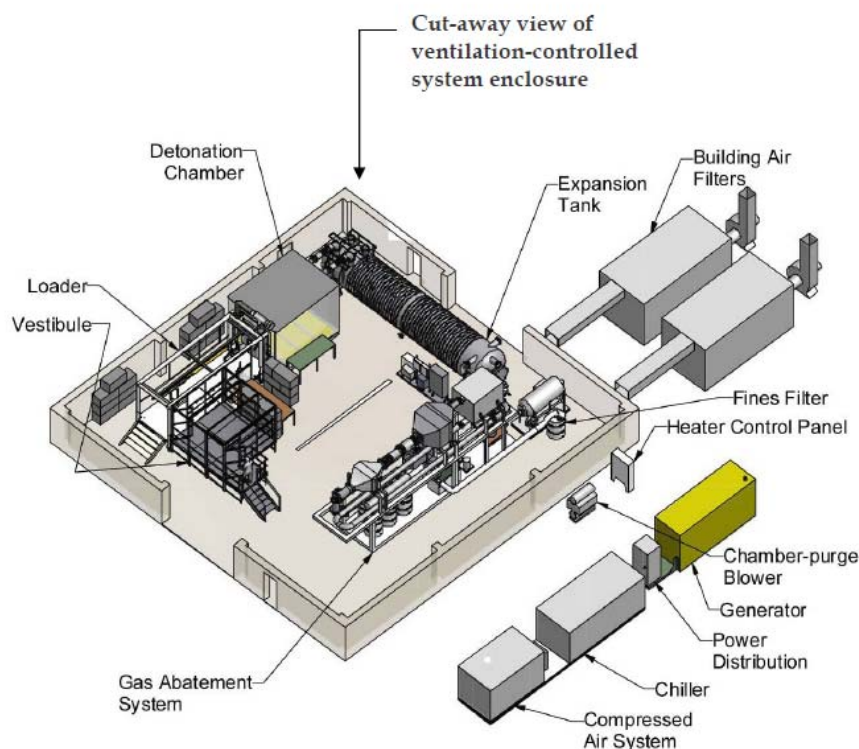


Figure 2-4. Diagram of the Transportable Detonation Chamber (TDC) System.

final filter into the environmental enclosure which would be constructed around the TDC system. The system has demonstrated a DRE of greater than 99.9999 percent for mustard agents.

The TDC unit is operated in a batch mode in which the sequence of loading the detonation chamber, then detonating the contents, and then purging the chamber is repeated over a 45-min interval. The purging process, during which the emissions from the chamber would be directed into the OTS, occurs over a 15-min period.

The TDC is considered a transportable unit, and it already has DDESB approval for the destruction of munitions containing high-explosive, smoke, riot control agents, incendiary fills, and propellants. The TDC has been extensively tested and evaluated by DOD organizations with an on-going chemical weapons demilitarization mission. It has previously been used to destroy range-recovered chemical munitions in Hawaii

(CMA 2008a) and recovered mustard-filled projectiles in Australia. Considerable documentation is available related to not only the viability of the TDC system, but also to the safety of the system.

Previous experience with operations of the TDC unit has indicated that the scrap metal from the munition bodies and explosive components coming from the unit would be head-space monitored to the vapor screening level (VSL) and disposed of in a RCRA landfill. The VSL concentration for mustard agent is 0.003 mg/m^3 .

If selected for deployment at the BGAD, two TDC units would be installed as part of the proposed EDT facility. The supporting infrastructure for the TDC units is described in Section 2.1.2.

2.1.1.3 The Detonation of Ammunition in Vacuum Integrated Chamber (DAVINCH) Unit

The DAVINCH technology was developed by Kobe Steel, Ltd. (a Japanese company), and has been used in Japan to destroy Japanese chemical bombs, some containing a mustard agent/lewisite mixture and others containing chemical agents that induce vomiting. A DAVINCH system has also been used in Belgium to destroy recovered chemical munitions from the World War I era (NRC 2009). Munitions placed inside the DAVINCH chamber are detonated in a near vacuum using a donor explosive charge to open the munitions and access the chemical agent (see Figures 2-5 and 2-6). The agent is mostly destroyed as a result of the high temperature and pressure generated by the shock wave followed by a fireball. The use of vacuum reduces noise, vibration, and blast pressure, thus increasing the life of the chamber.

The two main structural elements of the DAVINCH unit are an outer chamber and an inner chamber. The outer chamber is designed as a pressure boundary to withstand detonation pressure, and it provides a means for monitoring the detonation by strain gauges, embedded sensors and instrumentation that measure the conditions from and following destruction of munitions. The outer chamber is a multiple-layered, cylindrical shell, steel structure. The multiple layers act as crack arrestors to prevent cracks in the innermost layer from propagating into the outer layers due to the discontinuity of the structure. The inner chamber is designed to resist the impulsive load and to protect the outer chamber from associated munition fragments. After repeated use, the inner chamber would eventually need to be replaced, but because this inner vessel is easily removed and examined, it is considered a “sacrificial barrier” and is a readily replaceable component of the DAVINCH unit.



Figure 2-5. The Detonation of Ammunition in Vacuum Integrated Chamber (DAVINCH) Unit.

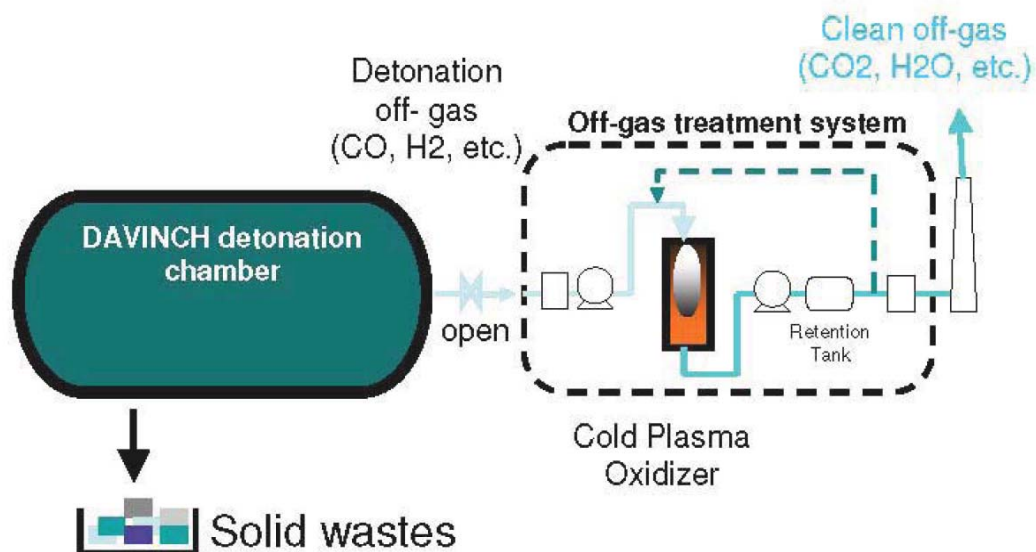


Figure 2-6. Schematic Diagram of the Detonation of Ammunition in Vacuum Integrated Chamber (DAVINCH) System.

Through the use of a moving deck with a robotic arm, the munitions are positioned for detonation in the chamber to optimize destruction energy and accommodate the destruction of multiple rounds. Following individual preparation of the munitions with a precise recipe of energetics calculated for the agent, agent condition, and physical configuration of the round, the donor charge is detonated by remote control after a pre-detonation procedure. The detonation results in the destruction of the munitions. The gaseous products from the detonation are kept under negative pressure in the detonation chamber throughout the process, excluding the positive pressure generated by the detonation, which lasts approximately 1 minute after detonation. The negative pressure prevents unexpected leakage of any gases. The detonation by-product gases are extracted by a vacuum pump through an off-gas pre-filter and sent to the off-gas treatment system. A predetermined amount of oxygen is mixed with the off-gas in a cold-plasma oxidizer unit where hydrogen and carbon monoxide would be converted into water and carbon dioxide, respectively.

The DAVINCH unit is operated in a batch mode in which the sequence of loading the containment vessel, then detonating the contents, then purging the vessel is repeated over a 70-min interval. The purging process, during which the emissions from the containment vessel would be directed into the off-gas treatment system, occurs over a 15-min period that is part of the aforementioned 70 minutes.

The off-gas from the DAVINCH system would be monitored at the outlet of the oxidizer, and it would then pass through the off-gas retention tank where it would be tested to confirm that any residual concentrations of mustard agent are in compliance with levels established in the proposed EDT facility's RCRA permit before the gas is discharged. After compliance has been confirmed, the gas would be discharged by the off-gas blower through an activated carbon filter system. The DAVINCH system has previously been given DDESB approval for use at Deseret Chemical Depot (DCD) to process selected mustard-filled munitions (DCD 2009); however, the unit was never used due to issues related to schedules. The DRE for the detonation product gas prior to any treatment has been determined to be greater than 99.9999 percent on nerve agent simulants.

If selected for deployment at the BGAD, two DAVINCH units would be installed as part of the proposed EDT facility. The supporting infrastructure for the DAVINCH unit is described in Section 2.1.2.

2.1.1.4 The Army's Explosive Destruction System (EDS) Unit

The EDS is a self-contained, transportable system that is designed to provide on-site treatment of chemical agents and munitions (see Figures 2-7 and 2-8). The primary component of the EDS is a thick-walled, stainless steel explosive containment vessel (detonation chamber). A reusable, advanced fragment suppression system (AFSS) would be



Figure 2-7. The Army's Transportable Explosive Destruction System (EDS).

installed inside the containment vessel. The AFSS serves as a support for the munitions and for the shaped charges, as well as a shield to protect the interior of the EDS containment vessel. The destruction processing at each EDS unit begins when the munitions are placed onto a special munition holder which fits into the AFSS. Then, shaped charges are placed near each munition. After the munitions and the shaped charges are assembled on the munition holder, the entire assembly is placed into the AFSS which is inside the containment vessel. Once the EDS containment vessel is sealed, the shaped charges are detonated.

Detonation of the shaped charges destroys the explosive component of the munition and opens its outer casing (munition body) to release the chemical fill under total containment (that is, no release to the environment). A neutralizing reagent [i.e., monoethanolamine (MEA)] is then pumped into the sealed containment vessel to react chemically with the mustard agent fill and with the agent-contaminated components of the munitions. After allowing the mixture of chemicals to react, a sample is drawn through the vessel door to verify that the fill has been neutralized. After verification, the waste products resulting from the EDS treatment process (e.g., debris and neutralents) are drained from the containment vessel into DOT approved containers for off-site shipment to a RCRA-permitted

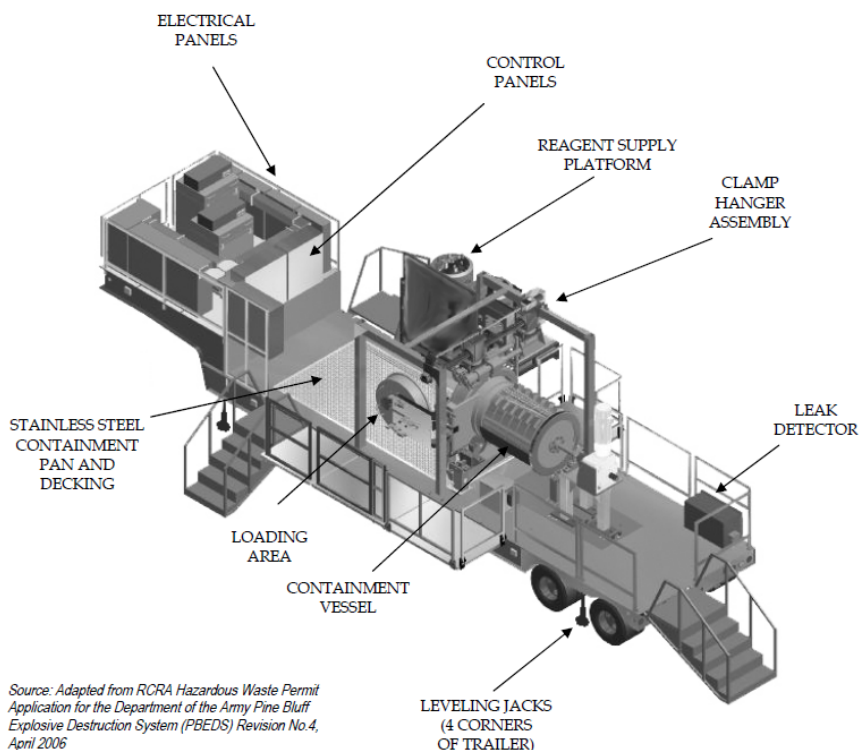


Figure 2-8. Equipment Layout for the Explosive Destruction System (EDS).

treatment, storage and disposal facility (TSDF). The EDS containment vessel is rinsed with water at the completion of each treatment cycle.

The operation of each EDS unit would involve one 10-hr processing cycle, as follows. The munitions would be placed into the containment vessel—followed by detonation and subsequent addition of the neutralizing reagent. Next, the byproducts of the neutralization reaction would be drained, and a heated rinsate would be added. A final rinsing of the containment vessel would occur after the vessel had cooled sufficiently. The containment vessel would then be opened to allow access to and removal of the munition debris and other solid waste. Two such cycles can be processed within a 24-hr period.

Neutralent and rinsate wastes are drained from the EDS containment vessel into the waste transfer system. Atmospheric emissions from each EDS unit originate from chemicals evaporating from these liquid wastes; therefore, no metal constituents or other non-volatile constituents would be released to the atmosphere. Atmospheric emissions from the EDS unit only occur when liquid is drained from the EDS containment vessel or when the vessel is

purged at the end of the treatment cycle. Because there is no induced air flow through the waste transfer system, the duration of emissions is very short. The typical duration of atmospheric emissions during the cycling of each EDS unit would be approximately 10 minutes for the draining of rinsate wastes (two times) and 15 minutes for the purge.

The pressure generated inside the vessel during the detonation and treatment is vented through a carbon filter, which removes any residual reagents and other chemicals from the air stream. The EDS system is capable of achieving a DRE of greater than 99.9999 percent for mustard agents.

The proven mobility of the EDS units will assist in expediting the treatment process for the mustard-filled munitions at the BGAD. While the EDS can be deployed quickly to deal with high priority munitions, it was originally designed for remediation of non-stockpile munitions (e.g., range-recovered rounds) and was not intended for long-term, large-scale demilitarization operations. Nevertheless, the EDS has the advantage of being a government-owned system that has already been given DDESB approval and used extensively at other locations [e.g., the Redstone Arsenal and the former Camp Sibert, both in Alabama; the Pine Bluff Arsenal in Arkansas (see CMA 2004); the former Rocky Mountain Arsenal in Colorado; and the Dugway Proving Ground in Utah]; therefore, an expedited approval process is possible, which may aid in rapid deployment and implementation of the proposed action if the EDS were to be used.

Previous experience with operations of the EDS unit has indicated that the scrap metal from the munition bodies and explosive components coming from the unit would be head-space monitored to the VSL concentration for mustard agent (0.003 mg/m^3) and disposed of in a RCRA landfill.

If selected for deployment at the BGAD, up to seven EDS units would be installed as part of the proposed EDT facility. The supporting infrastructure for the EDS units is described in Section 2.1.2.

2.1.2 Proposed Site, Layout, and Installation

Implementation of the proposed action requires the selection of a site for the EDT facility that would not disrupt the construction and systemization of the BGCAPP facility or other operations at the BGAD. As discussed in the following paragraphs, two separate locations are being considered for the site of the proposed EDT facility.

For an EDT facility that uses either the SDC, the TDC, or the DAVINCH system (but not the EDS system), the proposed facility would be constructed within the existing footprint of the BGCAPP and at the southwest portion of that footprint (see Figure 2-9). The surface of this area is currently a poured concrete pad surrounded by a storm drain that empties into a

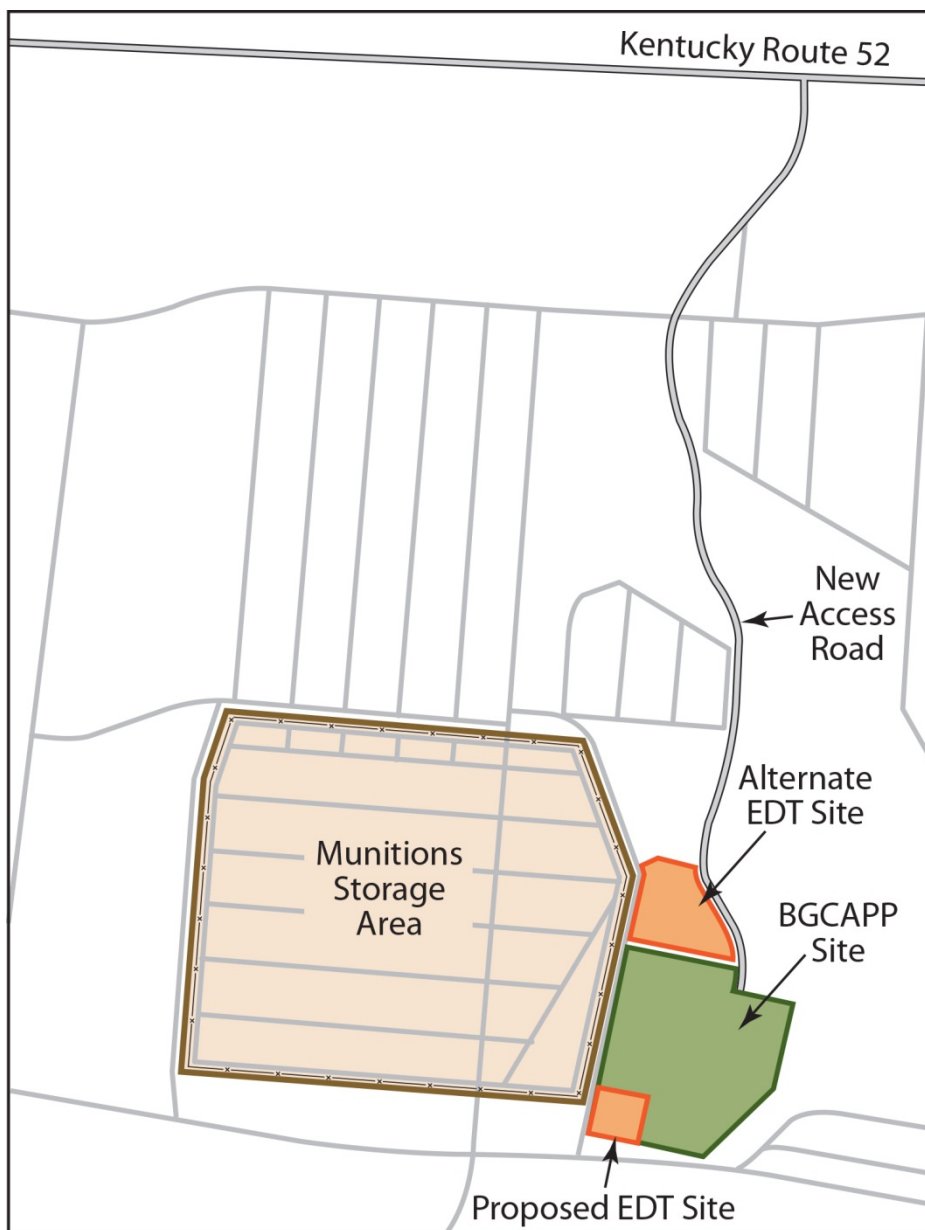


Figure 2-9. The Proposed Location and the Alternate Location for the EDT Facility at the Blue Grass Army Depot.

Note: The proposed site would be the location of an EDT facility with either the SDC, the TDC, or the DAVINCH units, while the alternate site would only be used with the multiple EDS units.

retention pond prior to discharge off-site. The pad is currently used as a lay-down area for BGCAPP construction materials. The potential environmental impacts of the siting of the BGCAPP, including the portion at its southwest corner, have previously been addressed, and no significant impacts were found (USACE 2004).

The area at the southwest corner of the BGCAPP footprint is not of sufficient size to accommodate an EDT facility that uses seven EDS units. If these EDS units were to be selected for deployment at the BGAD, then the alternate site shown in Figure 2-9 would be used for the proposed EDT facility. This alternate site currently serves as a lay-down area for construction materials used for the BGCAPP and is presently covered by layers of stone and compacted dense graded aggregate. The potential environmental impacts of the use of the lay-down area to the north of the BGCAPP have previously been addressed, and no significant impacts were found (Rogers 2010; USACE 2011).

The site for the proposed EDT facility would meet the applicable public access exclusion distances (PAEDs). The net explosive weight (NEW) quantity distances will be established in accordance with the applicable distances required by the DDESB. The proposed EDT facility must have approval from the DDESB before operations commence.

Regardless of which type of EDT system is selected for deployment, and regardless of which of the two sites in Figure 2-9 were to be used, each individual EDT unit would be set up inside its own environmental protection structure that would be constructed as part of the proposed EDT facility. Each environmental protection structure would be constructed on a concrete pad. This structure would be designed to provide negative pressure ventilation to prevent air leakage from the structure into the environment. Make-up air would be supplied through vents or louvers, and a filtration system would be provided. The filtration system would include filters, carbon filtration media, and the appropriate fans and motors to create a negative pressure inside the environmental protection structure.

The appropriate new infrastructure would be constructed, as needed, to support the proposed EDT facility. The entire EDT facility would be surrounded by the same type of security fences that will encompass the BGCAPP site. Access to the BGCAPP site would require passing through a guarded gate that would be staffed by security personnel 24 hours per day. Access to either of the two sites in Figure 2-9 would be provided by roads shared with the BGCAPP.

The topography of either of the two possible locations in Figure 2-9 consists of relatively flat terrain. Site preparation would therefore involve minimal grading, including possible small amounts of excavation and fill work. Additional site preparation activities would include the construction of concrete pads and parking areas, as well as the provision of firewater/potable water, natural gas, and electrical connections to the site. Electric power would be provided to the site by connections to the existing BGAD distribution system. Diesel-powered back-up generator sets would also be provided for critical systems (air

filtration and monitoring equipment) should the loss or interruption of power occur. New water, sewer, natural gas and communications connections would also be provided to the site by connections to existing BGAD utilities systems. Because each of the two possible locations for the proposed EDT facility in Figure 2-9 is in close proximity to the BGCAPP, and because these same types of utilities will be provided to the BGCAPP, the areas disturbed by the installation of any new utility connections to either of the two EDT sites would be minimal.

The site drainage system would be designed to divert surface water runoff from the site of the proposed EDT facility and to prevent erosion and surface water accumulation on the site. Leftover construction debris would be collected and transported to an off-site commercial site for disposal.

The SDC, TDC, and DAVINCH systems each consist of modularized components that would be assembled at the site. All necessary mechanical, electrical, and piping components would be included in these EDT modules. Any commodities—such as the insulation, ladders, platforms, piping, instruments, and raceways not installed on the modules—would be installed at the site.

Each EDS unit is contained on a trailer requiring a 30- by 60-ft level area with an impermeable surface barrier. Additional support equipment required for the proposed EDS units include reagent storage, spill response supplies, air compressor, munitions unpack and preparation area, and waste storage.

In addition to the equipment and components that are unique to each type of EDT unit (as described in the preceding paragraphs), the following support equipment and structures would be needed for the proposed EDT facility (external to the environmental protection structure), regardless of which type of EDT unit were to be employed and regardless of which of the two sites in Figure 2-9 were to be used. To the extent practicable, such equipment and structures would be shared with those planned for the BGCAPP.

- **Control Room.** The control room, including the necessary equipment for remote operation, is where the overall processing would be controlled and supervised. All necessary commands and settings would be performed from the operator stations inside the control room.
- **Heating, Ventilation and Air Conditioning (HVAC) Air Filtration Units and Stack.** The purpose of the HVAC air filtration units and stack would be to provide a negative pressure on the environmental protection structure and to capture any residual agent vapor in the exhaust air from the environmental protection structure.
- **Restrooms, Personal Protective Equipment Support, and Storage Building.** This building would provide a maintenance and storage facility to serve the proposed EDT

facility personnel. This building would house direct support staff required for operation of the unit in addition to worker facilities, such as restrooms, PPE, and storage areas.

- **Storage Magazines.** A storage magazine would be provided to temporarily hold the mustard projectiles awaiting processing in the proposed EDT facility. A service magazine would also be provided for storage of the shaped charges and/or donor charges to be used for either the TDC, DAVINCH, or EDS units (note that the SDC unit does not use explosive charges).
- **Secondary Waste Staging Area.** Because permitted storage locations for BGCAPP secondary wastes may not be available when the proposed EDT operations commence, a RCRA-compliant storage area would be established prior to the generation of RCRA wastes at the EDT facility.
- **Emergency Generator.** A back-up generator supplied by the EDT vendor would power essential equipment, as needed (for example, filters, induced draft fans, monitoring equipment, and lighting) to maintain the facility in a safe operating state in the event of a power failure.
- **Parking Area.** Parking would be established during construction in a temporary lot in close proximity to the EDT facility's construction access point.

2.1.3 Resource Requirements

The proposed EDT facility would require electricity, propane/natural gas, diesel fuel, water, explosive donor charges/shaped charges (except for the SDC which uses heat instead of explosives in the containment vessel), and other consumables as described above for each of the four types of EDT units. Diesel fuel would be used to power a back-up generator for the proposed EDT facility.

The estimated construction workforce for any of the four types of EDT systems would be approximately 40 to 50 workers, and the duration of construction is expected to be up to 27 months. The daily operational workforce for the SDC system would be approximately 20 to 25 workers; however, operation of the two-unit TDC system or the two-unit DAVINCH system would require approximately 40 to 50 workers, and the seven-unit EDS system would require up to 210 operational workers.

2.1.4 Waste Management

Construction wastes would be generated during the installation of the proposed EDT facility; however, the characteristics and quantities of such wastes would be similar to those

generated during the construction of any small-sized industrial facility. The quantities of such wastes at the BGAD would be small in comparison to the other types of waste generated during the construction of the much larger BGCAPP. All construction wastes would be initially placed into “roll-off” containers and then transferred to an off-site waste management vendor.

As shown in Table 2-2, the types of wastes to be generated by operation of the proposed EDT facility would include: (1) neutralents and reagents from the chemical reactions inside the unit’s containment vessel; (2) decontaminated metal munition fragments and, in the case of the DAVINCH unit, inner chamber fragmentation shields; (3) spent rinse water and decontamination solutions; (4) spent filter elements, including those from the off-gas treatment system; (5) dunnage and miscellaneous solids, such as spent cleanup materials, debris, and storage and packaging materials associated with the munitions; (6) contaminated PPE, if any; and (7) miscellaneous liquid wastes, such as fluids containing laboratory wastes, waste oils and solvents.

Wastes generated from the proposed EDT facility would be appropriately characterized and containerized. Wastes, such as neutralents, directly associated with or derived from the mustard agent would be managed as a hazardous waste and would require additional hazardous waste treatment and/or disposal. If laboratory analysis shows that mustard agent is present at concentrations higher than the release criteria, then the waste would be further treated or managed onsite as a hazardous waste prior to being shipped offsite for treatment or disposal. All other wastes that are not potentially contaminated with mustard agent would be sampled and analyzed for the presence of RCRA characteristics to include toxic chemicals. Solutions and rinse waters which are determined to be non-hazardous and which meet the BGAD’s discharge requirements may be sent to the existing BGAD wastewater treatment facility or shipped offsite to an appropriate waste management facility. The munition bodies and other metal parts would be treated to remove residual mustard agent and then would be shipped offsite for recycling, as has been done for metal scrap from the Army’s other chemical weapons destruction facilities.

Any wastes destined for shipment to an off-site TSDF(s) would be stored only temporarily on/near the site of the EDT facility. Such wastes would be containerized and moved to a less-than-90-day or to a permitted waste storage area at the BGAD where they would be stored pending shipment to the off-site TSDF.

2.1.5 Approvals, Permits, and Conditions

Before implementing the proposed action, the Army would be required to coordinate its actions with various federal, Commonwealth of Kentucky, and local regulatory

Table 2-2. Types of Waste to be Generated during EDT Operations.

Name of EDT System	Typical Waste
Static Detonation Chamber (SDC)	<ul style="list-style-type: none"> • Dust collected from the cyclone and dust collection system • Filter cake and salts from the off-gas scrubber system • Spent calcium carbonate and salts from the baghouse filter
Transportable Detonation Chamber (TDC)	<ul style="list-style-type: none"> • Pea gravel (to cover floor of chamber) • Hydrated-lime derived salts from the off-gas treatment system • Spent candle filters from off-gas treatment system
Detonation of Ammunition in Vacuum Integrated Chamber (DAVINCH)	<ul style="list-style-type: none"> • Disposable inner chamber liner • Condensate water • Dust collected in the filters
Explosive Destruction System (EDS)	<ul style="list-style-type: none"> • Liquid waste (monoethanolamine-based hydrolysate) • Rinse water (from chamber clean-out activities)
Types of Waste Common to Each of the Above Four EDT Systems	<ul style="list-style-type: none"> • Scrap metal (e.g., munition bodies) • Spent carbon filter media from the off-gas treatment system and the environmental protection structure ventilation system • Spent decontamination solutions • Personnel protective equipment (PPE) • Dunnage (including wooden storage pallets) • Miscellaneous liquid wastes, such as fluids containing laboratory wastes, waste oils and solvents

Sources: Data provided by EDT vendors.

authorities. At a minimum, Clean Air Act (CAA), Clean Water Act (CWA), and RCRA permits would need to be in place for the proposed EDT facility prior to beginning construction.

The U.S. Environmental Protection Agency (EPA) has delegated full authority to the Commonwealth of Kentucky to administer the EPA's National Pollutant Discharge Elimination System (NPDES) permitting, compliance and enforcement programs. Under this authority, the state of Kentucky may require a Kentucky Pollutant Discharge Elimination System (KPDES) permit in addition to a sanitary sewage permit and a general construction storm water permit for the proposed EDT facility. The general permit would require preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP establishes the specific requirements for management of storm water at the site of the proposed EDT facility. The existing SWPPP for the construction of the BGCAPP would be revised as needed to include the construction of the proposed EDT facility.

As discussed in Section 2.1, approval of the SPSS document by the DDESB is a prerequisite to operation of the selected EDT systems. A primary function of the DDESB is to review and approve the safety aspects of all plans for siting, construction, or modification of ammunition and explosives DOD facilities to include possible impacts on nearby structures and activities. In addition, the U.S. Department of Health and Human Services (DHHS) would continue its advisory role, reviewing data and making appropriate recommendations concerning public health and safety before operations begin with actual mustard agents.

In conjunction with the anticipated permitting requirements of the KDEP, the Army elected to undertake the development of a human health risk assessment on the emissions associated with the proposed EDT facility. Such a risk assessment has been prepared, and the findings have been incorporated into the assessment of human health risks in Section 3.1.3.1 of this EA.

After completing construction of an EDT facility that uses the EDS units, the Army would conduct a pre-operational survey prior to placing the facility into operation. For an EDT facility that uses either the SDC unit, the TDC units, or the DAVINCH units, the Army would test the EDT facility for DDESB system approval prior to placing the facility into operation. The initial tests would be conducted with agent surrogates; then, actual trials would be conducted with actual chemical munitions. The results of the test runs would be submitted to the Commonwealth of Kentucky. If the test run results are acceptable, the Commonwealth of Kentucky would impose final operating conditions as necessary, based largely on the requirements of RCRA. As long as the EDT facility remains in operation, the Army would be subject to a variety of reporting, inspection, notification, and other permit requirements. RCRA also requires the Army to submit periodic operating reports to the Commonwealth of Kentucky.

2.1.6 Decommissioning and Closure

Upon the completion of the mission of the proposed EDT facility, the EDT units would be appropriately decontaminated and clean-closed (i.e., all hazardous wastes and residues would be removed or decontaminated to levels below applicable standards and limits). The transportable units would thus become available for use at locations other than the BGAD. If not immediately reused, the transportable units would be placed into a lay-away status and maintained in a condition ready for deployment to any location where they might be needed in the future.

Following decontamination and clean-closure, the enclosure for the EDT facility and the supporting equipment would be dispositioned in agreement with the facility's closure plan. All foundations and concrete pads that were constructed and/or used to support the EDT facility, as well as all utility connection and infrastructure improvements, would be left in place. At the conclusion of EDT operations, and upon the decommissioning and closure of the site of the EDT facility, the site would become available for other uses.

2.2 THE NO-ACTION ALTERNATIVE

Under the no-action alternative, the site modifications required to support an EDT facility at the BGAD would not be performed. No EDT facility would be constructed or operated at the BGAD; hence, there would be no environmental impacts from constructing, operating, or decommissioning such a facility.

The no-action alternative involves the use of the BGCAPP to destroy the BGAD inventory of mustard-filled 155mm projectiles and DOT bottles, even though the current BGCAPP design would not be able to handle the anticipated problems with stuck bursters and/or solidified mustard agent. Therefore, under the no-action alternative, certain modifications would need to be made to the BGCAPP in order to accommodate the processing of the problematic mustard-filled 155mm projectiles.

The current design of the BGCAPP includes a munition disassembly capability that would be able to mechanically remove the burster from each projectile in the BGAD inventory in order to fully access the mustard agent inside the projectile. This agent would then be drained from the projectile body for subsequent destruction by chemical neutralization processes. Any residual agent left inside the projectile body after the draining process would be destroyed (and the metal projectile body would be decontaminated) via a thermal process inside the BGCAPP's metal parts treater (MPT). As discussed in Section 1.1.1, stuck bursters and/or the solidified state of the mustard agent in the 155mm

projectiles are anticipated to create significant problems with the planned munition-draining activities in the BGCAPP's current design.

Modifications to the current BGCAPP design to accommodate the anticipated problems with the draining of the mustard-filled 155mm projectiles would include new equipment with the ability to: (1) remove stuck bursters with or without manual intervention, (2) successfully wash out the liquid mustard agent and all solid heels from the projectile body, (3) manage the transfer of residual quantities of heel to—and also process those heels in—the MPT, if the heels could not be successfully washed out of the projectile body, (4) maintain overall BGCAPP process efficiency, and (5) maintain the overall BGCAPP cost and schedule. The Army's experience with problematic mustard-filled munitions at the TOCDF is relevant to the discussion of the modifications that would be required at the BGCAPP under the no-action alternative in this EA. The TOCDF experience has been documented in an end-of-campaign report (EG&G 2013) and is summarized in the following paragraphs.

During a 64-day processing period between mid-November 2011 and mid-January 2012, a total of 198 overpacked mustard-filled 155mm projectiles were processed and destroyed at the TOCDF. A processing rate of approximately 3 projectiles per day was thus achieved. The problems encountered at the TOCDF during the processing of these projectiles included internal corrosion resulting in stuck bursters and solidified mustard agent heels (i.e., the same types of problems anticipated for the BGAD mustard-filled 155mm projectiles).

A specialized cutter was designed and installed at the TOCDF to provide better access to the agent inside the projectiles. The removal of the bursters (which sometimes also involved the removal of the fuze adapter with the burster well attached) was accomplished manually by workers wearing appropriate PPE. Even with this manual-intervention approach, some bursters/burster wells were not able to be removed, and the projectiles were therefore subjected to a multi-day soaking process in an effort to loosen the burster well. Eventually, the TOCDF workers were able to remove all of the bursters/burster wells.

A washout system was installed at the TOCDF to dislodge solid heel material from the projectiles. The washout system used a water-driven, rotating nozzle to spray upward into the projectile while the projectile was held in a nose-down position. The nozzle was powered by hot process water (140°F at 3000 psi) supplied by an existing pressure washer. During the washout operations, the operators wore PPE while placing the projectile into position at the washout station. The height of the nozzle was adjusted manually, then the operators exited the area, and the washout process was initiated and monitored remotely. After a period of washing, the operators re-entered while wearing PPE to inspect the projectile to determine if the solid heel had been dislodged. The washout process was repeated as necessary. The rinsate coming out of the projectile was drained into a sump after being put through a strainer to collect any cutting debris or explosive solids debris from the burster. The washout system

proved to be effective in removing solid heel material from the mustard-filled 155mm projectiles at the TOCDF.

During the processing of the 198 mustard-filled 155mm projectiles at the TOCDF, approximately 600 entries were performed by worker wearing PPE. During the projectile campaign, there was one PPE suit tear and one PPE suit breach associated with the cutter operations. Breaches are defined as a loss of suit integrity rendering a layer of suit protection questionable. A suit tear indicates abrupt failure of a layer of suit protection. The risks of such incidents include potential exposure of the worker to mustard agent.

While the details of any modifications to the current BGCAPP design do not presently exist, it is envisioned that any such modifications to handle the problematic BGAD 155mm projectiles would be similar to those described above as implemented at the TOCDF.

It should be noted that the use of the proposed EDT facility (i.e., the proposed action) to process the entire BGAD inventory of mustard-filled 155mm projectiles and DOT bottles would completely eliminate the need for a design modification to the BGCAPP to handle any mustard-filled munitions and would also completely eliminate the need for any mustard campaign whatsoever at the BGCAPP because the 155mm projectiles and DOT bottles contain the total inventory of mustard agent at the BGAD. Under the proposed action, the mission of the BGCAPP could therefore focus solely on the campaigns to destroy two chemical warfare agents (i.e., the nerve agents GB and VX) instead of three.

2.3 ALTERNATIVES TO THE PROPOSED ACTION

While the Army has constructed and operated incineration facilities at other depots for the purpose of destroying lethal chemical agents and munitions in the U.S. stockpile, none of these facilities are located in Kentucky. Congress has specifically prohibited (see Public Law 103-337, 50 USC 1512a) the transport of any chemical munitions that constitute part of the U.S. chemical weapons stockpile out of the state in which those munitions are presently stored. Thus, the off-site shipment of chemical munitions from the BGAD for treatment or processing at the Army's other chemical weapons destruction facilities is not a viable alternative.

In regard to the use of technologies other than the BGCAPP chemical neutralization processes or an EDT processes to destroy the agents and munitions at the BGAD, the 2002 FEIS (PMCD 2002) included an assessment of four destruction technologies, including incineration. The Record of Decision (ROD) for the 2002 FEIS selected on-site chemical neutralization followed by supercritical water oxidation (SCWO), and the BGCAPP is currently being constructed at the BGAD to implement that decision. The ROD noted that

public and local concerns and viewpoints (such as those opposed to the use of incineration technologies at the BGAD) were a factor in that decision (Fatz 2003).

For the reasons stated above, on-site processing—as examined in this EA under the proposed action and the no-action alternative—is the only viable option for the destruction of the mustard-filled munitions and DOT bottles that are currently being stored at the BGAD.

The following constraints pertain to the identification of feasible alternatives for the proposed action under consideration in this EA:

- Some of the EDT units under consideration are commercial systems that would be constructed at the BGAD and operated by contractor personnel. For the proposed EDT facility, system availability and shared resources with the BGCAPP were considered when developing feasible alternatives for this EA.
- The proposed EDT facility at the BGAD must not interfere with on-going construction, systemization, and operation of the BGCAPP or have any other significant operational impacts at the BGAD. The location of the proposed EDT facility, its use, and personnel have been considered in this EA.
- Implementation of the proposed action identified in this EA is contingent upon allocation of funding to support the anticipated schedule and avoid conflicts with the construction and systemization of the BGCAPP.

Over the life cycle of the ACWA program, many technologies have been assessed for their viability of destroying chemical weapons. These technologies were again reviewed for application towards the purpose and need of the proposed action which is the subject of this EA. This review included consideration of water-jet cutting, cryofracture (i.e., extremely low-temperature processing), and current manual cutting and accessing methods within the U.S. Army Chemical Materials Activity (CMA) program. None of these technologies are able to destroy chemical warfare agents, and all would require further treatment at the BGCAPP thereby introducing potential safety, programmatic, and environmental risks because of the need to modify, develop, or construct new processes, facilities, and handling procedures for these problematic mustard-filled 155mm projectiles and DOT bottles. These approaches were therefore determined not to be viable alternatives and have not been evaluated further in this EA.

No systems other than the BGCAPP or one of the four types of EDT systems as considered in this EA (i.e., the SDC, the TDC, the DAVINCH, and the EDS) were identified that could satisfy the purpose and need of the proposed action for the destruction of the mustard filled munitions and DOT bottles at the BGAD; hence, no alternatives other than the proposed action and the no action alternative are evaluated in this EA.

3. THE AFFECTED ENVIRONMENT AND POTENTIAL ENVIRONMENTAL CONSEQUENCES

This EA addresses the proposed action of constructing and operating an EDT facility at the BGAD for the destruction of mustard-filled chemical munitions and containers. Section 3.1 discusses the environmental resources that could be affected by the proposed action and describes the potential environmental impacts upon those resources. Section 3.1.2 discusses the potential environmental impacts of the no-action alternative.

3.1 IMPACTS OF THE PROPOSED ACTION

The proposed action would create no significant impacts upon the following categories of environmental resources, which are not discussed in further detail in this EA.

- **Land use.** The land use impacts of constructing the proposed EDT facility at the BGAD would be relatively minor (i.e., use of between 2.5 and 10 acres within the installation boundaries of the 14,596-acre BGAD). For an EDT facility that uses the SDC, the TDC, or the DAVINCH system, the proposed facility would be constructed within the existing footprint of the BGCAPP and at the southwest portion of that footprint (see Figure 2-9). The surface of this area is a poured concrete pad that is used as a lay-down area for BGCAPP construction. The potential environmental impacts of siting the BGCAPP, including the portion at its southwest corner, have previously been addressed, and no significant impacts were found (USACE 2004). For an EDT facility that uses the EDS system, the proposed facility would be constructed at the alternate site north of the BGCAPP shown in Figure 2-9. This alternate site also serves as a lay-down area for BGCAPP construction and is covered by layers of stone and compacted dense graded aggregate. The potential environmental impacts of using this lay-down area north of the BGCAPP have previously been addressed, and no significant impacts were found (Rogers 2010; USACE 2011). Thus, both the site for the SDC, the TDC, or the DAVINCH systems, as well as the site for the EDS system, have been assessed under NEPA, are currently disturbed, and are managed under the BGAD's existing Integrated Natural Resources Management Plan (Stout et al. 2010). Therefore, construction of the proposed EDT facility at either site would have no significant impacts to either on-site or off-site land use. Similarly, the human health risk assessment for the proposed EDT facility (see Section 3.1.3.1) identified no significant impacts to either on-site or off-site land use as a result of the emissions of the EDT facility over its operational lifetime.

- **Groundwater resources.** None of the water used at the BGAD originates from groundwater sources. No groundwater would be consumed, diverted, or affected by the proposed action. The 2002 FEIS (PMCD 2002) addressed the potential for impacts to groundwater resources that might result from spills. The FEIS concluded that if spills or leaks of hazardous materials were to occur, then procedures for recovering these materials would be applied to minimize the potential for groundwater contamination. For the above reasons, no significant impacts to groundwater resources would be expected to occur as a result of the proposed action.
- **Aquatic resources and wetlands.** No aquatic resources or wetlands would be disturbed or affected by the proposed action. Wetlands are located near each of the two possible locations (as shown in Figure 2-9) for the proposed EDT facility. Wetlands can be found approximately 0.5 mi south of the BGCAPP footprint (based on National Wetland Inventory maps; see FWS 2012) and approximately 1500 ft east of the alternate site for the EDT facility (USACE 2011). A site investigation has been performed by the U.S. Army Corps of Engineers, and it was determined that no regulated wetlands would be impacted by the construction of the BGCAPP (USACE 2004). Because the two possible sites for the proposed EDT facility are either wholly contained within the footprint of the BGCAPP facility or immediately adjacent to the BGCAPP footprint, the same conclusion can be reached for each of the two sites for the proposed EDT facility. Furthermore, implementation of best management practices for erosion and siltation control during construction would prevent any significant impacts to aquatic resources and wetlands as a result of the proposed action.
- **Aesthetics.** The physical layout of the proposed EDT facility would resemble that of any small-scale industrial facility, and regardless of which of the two sites shown in Figure 2-9 is chosen, the structures at the proposed EDT facility would blend in with the other structures being constructed at the BGCAPP. For the site of an EDT facility using the SDC, the TDC, or the DAVINCH system, the nearest installation boundary is approximately 1.6 miles away. For the alternate site of an EDT facility using the EDS system, the nearest installation boundary is approximately 1.3 miles away. Hence, the presence of the EDT facility at either site would not be expected to adversely affect viewsheds or the aesthetic characteristics of the area in which the BGCAPP is already located. Therefore, no significant impacts to aesthetic resources would occur as a result of the proposed action.
- **Cultural (i.e., archaeological and historic) resources.** Cultural resources within the BGAD boundaries are managed under the BGAD's existing Integrated Cultural Resources Management Plan (BAI 2008). Potential impacts to cultural resources have been previously evaluated for each of the two sites (USACE 2004; USACE 2011).

Because the proposed action would occur within one of two existing, previously disturbed sites that are currently used as lay-down areas for BGCAPP construction, no potential exists for the proposed action to disturb or affect cultural resources. Therefore, no significant impacts to cultural resources would occur at either site as a result of the proposed action.

Potential impacts to the following categories of environmental resources are discussed in the following subsections: air quality (Section 3.1.1), surface water resources (Section 3.1.2), human health and safety (Section 3.1.3), terrestrial ecological resources (Section 3.1.4), socioeconomic resources (Section 3.1.5), environmental justice (Section 3.1.6), noise (Section 3.1.7), and waste management and off-site transportation of wastes (Section 3.1.8). Impacts due to resource requirements are discussed in Section 3.1.9, and impacts from decommissioning and closure of the proposed EDT facility are discussed in Section 3.1.10.

3.1.1 Air Quality

This subsection addresses the potential impacts to air quality that might result from the construction or operation of the proposed EDT facility. The analyses focus on the criteria pollutants that might be emitted. Criteria pollutants are defined as those pollutants regulated by the National Ambient Air Quality Standards (NAAQS) that have been established by the EPA to protect human health and welfare (40 CFR Part 50). NAAQS exist for the pollutants sulfur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃), carbon monoxide (CO), lead (Pb), and particulate matter less than or equal to 10 µm in aerodynamic diameter (PM₁₀) and also less than or equal to 2.5 µm in diameter (PM_{2.5}). These are called criteria pollutants because the criteria for regulating them under the Clean Air Act (CAA) must be published, reviewed, and updated periodically to reflect the latest scientific knowledge.

The NAAQS are expressed as concentrations of pollutants in the ambient air, i.e., in the outdoor air to which the general public has access [see 40 CFR Part 50(e)]. The primary NAAQS values define levels of air quality that the EPA deems necessary, with an adequate margin of safety, to protect human health. Secondary NAAQS values are similarly designated to protect human welfare by safeguarding environmental resources (such as soils, water, plants, and animals) and manufactured materials. The primary and secondary standards are currently the same for all pollutants and averaging periods except for (1) CO, which has no secondary standard for the 8-hr averaging period, (2) NO₂, which has no

secondary standard for 1-hr averaging period, (3) PM_{2.5}, which has separate primary and secondary standards for the annual average as explained below, and (4) SO₂, which has no secondary standard for the 1-hr averaging period and no primary standard for the 3-hr averaging period.

States may modify NAAQS to make them more stringent or to set standards for additional pollutants. The Commonwealth of Kentucky has adopted the NAAQS as state standards without modification and has also established standards for hydrogen sulfide, gaseous fluorides (expressed as hydrogen fluoride), total fluorides, and odors. None of the four EDT systems under review in this EA is a source of either hydrogen sulfide or hydrogen fluoride.

The current NAAQS levels are shown in Table 3-1. In December 2012, the EPA revised the ambient annual PM_{2.5} primary standard decreasing it from 15 to 12 µg/m³ and making this revised value effective on March 18, 2013 (78 FR 3086-3287). The secondary standard for annual PM_{2.5} remains unchanged at 15 µg/m³. The 24-hr NAAQS levels for both primary and secondary PM_{2.5} also remain unchanged at 35 µg/m³.

3.1.1.1 Ambient conditions and existing emissions

The BGAD is located in Madison County in east-central Kentucky, southeast of the cities of Lexington and Richmond (see Figure 3-1), on a 14,596-acre site composed mainly of open fields and wooded areas. The BGAD is located along the Interstate-75 corridor which parallels the western boundary of the depot. The terrain is characterized as gentle rolling. The regional climate for Madison County is humid continental with warm summers and cold winters. Summers tend to be humid and stormy, while winters are generally cold with a few mild periods.

Among all seven NAAQS criteria pollutants (CO, SO₂, NO₂, O₃, Pb, PM₁₀, and PM_{2.5}), only Pb and PM_{2.5} are monitored in Madison County. The latest monitoring data for the county's Pb show that Madison County was within the compliance level of the NAAQS standard (KYDAQ 2012) with the maximum rolling 3-month average of 0.09 µg/m³ for 2011, which is less than the NAAQS value of 0.15 µg/m³ for Pb. Madison County's PM_{2.5} data in 2011 show an annual mean of 9.18 µg/m³ and the maximum 24-hr average was 23.1 µg/m³. Both of these values are less than the NAAQS for the annual mean of 12.0 µg/m³ for PM_{2.5} and the 24-hour standard of 35 µg/m³. The County has also been in compliance for the past 3 years, through 2011.

A major violation of the National ozone standard in Kentucky occurred in 2011 in the Cincinnati-Hamilton Metropolitan area on the border with the State of Ohio; however, the violation did not affect the ozone compliance status of Madison County. The northern

Table 3-1. National Ambient Air Quality Standards (NAAQS), effective March 2013.

Pollutant	Primary/ Secondary	Averaging Time	Level ⁽¹⁾	Form
Carbon Monoxide (CO)	primary	8-hr	9 ppm (10 mg/m ³)	Not to be exceeded more than once per year
	primary and secondary	1-hr	35 ppm (40 mg/m ³)	Not to be exceeded more than once per year
Lead (Pb)	primary and secondary	Rolling 3-month average	0.15 µg/m ³ (2)	Not to be exceeded
Nitrogen Dioxide (NO ₂)	primary	1-hr	100 ppb (188 µg/m ³)	98th percentile, averaged over 3 years
	primary and secondary	Annual	53 ppb (3) (100 µg/m ³)	Annual mean
Ozone (O ₃)	primary and secondary	8-hr	75 ppb (4) (147 µg/m ³)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution (PM _{2.5})	primary	Annual	12 µg/m ³ (5)	Annual mean, averaged over 3 years
	secondary	Annual	15 µg/m ³	Annual mean, averaged over 3 years
	primary and secondary	24-hr	35 µg/m ³	98th percentile, averaged over 3 years
Particle Pollution (PM ₁₀)	primary and secondary	24-hr	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO ₂)	primary	1-hr	75 ppb (6) (196 µg/m ³)	99th percentile of 1-hr daily maximum concentrations, averaged over 3 years
	secondary	3-hr	0.5 ppm (1300 µg/m ³)	Not to be exceeded more than once per year

Notes:

(1) The units shown in parenthesis (in µg/m³) for the criteria pollutants were converted from their respective ppm or ppb units based on ideal gas law at the standard temperature (293K) and pressure (1 atm) condition.

(2) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m³ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(3) The official level of the annual NO₂ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hr standard.

(4) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hr ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hr ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

(5) Final rule signed December 14, 2012 (see 78 FR 3086-3287). The standard (12 µg/m³ as an annual average) became effective on March 18, 2013.

(6) Final rule signed June 2, 2010. The 1971 annual and 24-hr SO₂ standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Source: Current NAAQS values are available on-line at <http://www.epa.gov/air/criteria.html>.

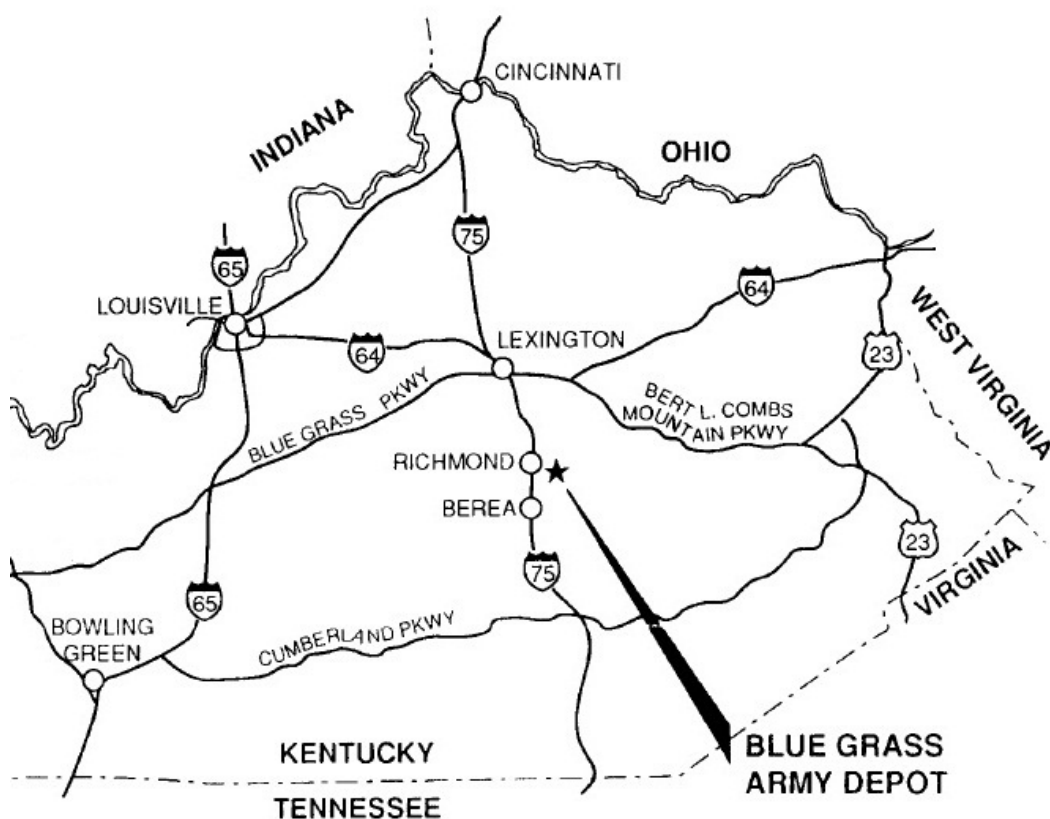


Figure 3-1. Location of the Blue Grass Army Depot within the Commonwealth of Kentucky.

Kentucky counties that were out of compliance with the 8-hr ozone standard included Boone, Campbell, and Kenton. Although there was no ozone monitoring in Madison County, there were two ozone monitors in the nearby counties. One was at Lexington Primary (in Fayette County) and the other at Nicholasville (in Jessamine County). The 8-hr maximum ozone data in both counties showed exceedances in 2011. However, the 8-hr 4th maximum data values for both counties up to 2011 were less than the NAAQS. Both counties were in compliance with the NAAQS ozone standard.

The 2012 State Implementation Plan indicates that Madison County and its neighboring Counties would not be out of compliance with any of the NAAQS criteria pollutants (KYDAQ 2012). This effectively rules the BGAD as being in compliance with

the NAAQS. Estimates of the ambient values for each criteria pollutant were obtained from the Kentucky Division of Air Quality (KYDAQ) (see KYDAQ 2012) as shown in Table 3-2. These values are indicators of ambient concentrations applicable to the specific geographic area. The values are either actual monitoring data in Madison County or the maximum concentration in the State of Kentucky or in the neighboring county; thus, representing a highly conservative estimate of the ambient background concentration for the airshed over BGAD. According to the KYDAQ (2012), the values in Table 3-2 are suitable for use when adding them to the estimated impacts of the emissions from the proposed action for the purpose of determining cumulative air quality impacts in comparison to the NAAQS levels. However, these ambient values would not be suitable beyond that scope of use, for example for use in permitting activities related to the proposed action. As can be seen in Table 3-2, the ambient concentrations of several of the criteria pollutants represent a substantial fraction of the respective NAAQS levels.

3.1.1.2 Potential air quality impacts of construction

Construction-related emissions and resulting increases in ambient-air concentrations of pollutants would be much less for an EDT facility using any of the four types of EDT systems than for construction of the BGCAPP, because the BGCAPP facility requires the disturbance of a much larger land area during its construction. Fugitive dust resulting from excavation and earthwork would dominate the air-quality impacts of any construction involved. Existing literature provides estimates of construction-related particulate emissions in terms of mass generated per unit area per unit time (EPA 1985).

Particulate Matter. Emissions of particulate matter (also called fugitive dust) would result from excavation and earthwork at the site of the proposed EDT facility. The entire area that would be occupied by the proposed EDT facility was assumed to be under construction at all times; however, because construction activities usually occur in phases, the actual area under construction on any given day is likely to be much less, especially for earthwork activities involving installation of utilities such as pipes or power lines. The size of the construction area used in the modeling in this EA includes consideration of the maximum size available for the proposed EDT facility. That is, the proposed site in Figure 2-9 would be no larger than 3 acres, while 10 acres are associated with the alternate site in Figure 2-9. Routine dust suppression measures (e.g., sprinkling with water) were assumed to reduce particulate emissions by 50 percent (EPA 1985).

The modeled PM₁₀ concentrations resulting from the proposed construction were added to estimates of existing background dust concentrations in the region as obtained

Table 3-2. Ambient Air Concentrations of NAAQS Criteria Pollutants.

Criteria Pollutant	Averaging Time	Ambient Concentration	Ambient Concentration as Percent of NAAQS value
Carbon Monoxide (CO) ^a	8-hr	2 ppm (2.2 mg/m ³)	22%
	1-hr	2.9 ppm (3.2 mg/m ³)	8%
Lead (Pb) ^b	3-month average	0.04 µg/m ³	27%
Nitrogen Dioxide (NO ₂) ^c	1-hr	0.049 ppm (92 µg/m ³)	49%
	Annual	0.008 ppm (15 µg/m ³)	15%
Ozone (O ₃) ^d	8-hr	0.069 ppm (135 µg/m ³)	92%
Particle Pollution (PM _{2.5}) ^e	Annual	9.18 µg/m ³	77%
	24-hr	23.1 µg/m ³	66%
Particle Pollution (PM ₁₀) ^f	24-hr	36 µg/m ³	24%
Sulfur Dioxide (SO ₂) ^g	1-hr	0.035 ppm (92 µg/m ³)	47%
	3-hr	N/A ^h	N/A

Notes:

^a Maximum 8-hr and 1-hr average CO concentration for the State in 2011 from Louisville in Jefferson County.

^b Rolling 3-month average Pb concentration for Madison County from Richmond.

^c 3-year average 98th percentile 1-hour NO₂ and annual arithmetic mean concentrations from Lexington in Fayette County.

^d 3-year average 4th maximum O₃ concentration from Lexington in Fayette County.

^e 24-hr and annual average PM_{2.5} concentrations for Madison County from Richmond.

^f 24-hr average PM₁₀ concentration from Lexington in Fayette County.

^g 3-year average of daily maximum 1-hr SO₂ data from Lexington in Fayette County. No secondary SO₂ data were available.

^h NA = No data available.

Source: Kentucky Division of Air Quality, *Fiscal Year 2012 Annual Report*, Kentucky Department for Environmental Protection, Frankfort, Ky., September 2012; Available on-line at http://air.ky.gov/SiteCollectionDocuments/Annual_Report_2012.pdf

from Table 3-2. The modeled emissions due to construction were obtained from the 2002 FEIS (PMCD 2002). Actual concentrations at particular locations within the broad area around BGAD are subject to spatial variations, especially for particulate matter, and also to temporal variations including long-term trends. Therefore, on-site PM₁₀ sources were also included in the modeling.

The results of the modeling of particulate matter emissions from the construction of the proposed EDT facility at either of the two sites shown in Figure 2-9 are presented in Table 3-3. As stated above, estimates of background particulate matter concentrations have also been obtained, and these estimates are included in Table 3-3 for the purpose of determining the cumulative impacts to air quality due to particulate matter. No information is available in regard to any additional, future sources of emissions that might exist in Madison County during the same time frame as the proposed EDT facility, and no new facilities have been identified that would become major sources of NAAQS criteria pollutants (Madison County 2010); hence, no such future emissions have been accounted for in Table 3-3.

For the purpose of modeling in this EA, emissions of PM_{2.5} were assumed to be one half of the PM₁₀ emissions (i.e., half of the PM₁₀ emitted was assumed to be PM_{2.5}). The modeled incremental concentrations in Table 3-3 are considered to be conservative due to the following assumptions: (1) the entire area would be under disturbance from construction at all times, (2) rates of dust emissions from the construction site would be constant over the entire construction area and over time, (3) settling of airborne particles due to gravity and removal by wet/dry deposition would be negligible. The results in Table 3-3 show that no exceedance of the NAAQS level for either PM₁₀ or PM_{2.5} would be expected to result from construction of the proposed EDT facility, even if 10 acres were to be disturbed simultaneously during construction.

Because the NAAQS, which are set to protect public health and welfare with an adequate margin of safety, would not be expected to be exceeded as a result of the proposed construction activity, the expected air quality impacts would be minor. As noted above, dust suppression measures (e.g., sprinkling with water) would be used as necessary to control fugitive dust and comply with local and state laws and regulations concerning the control of dust generated by construction activities.

Vehicular Emissions. Temporary and localized increases in atmospheric concentrations of NO₂, CO, SO₂, volatile organic compounds (VOCs), and particulate matter would result from exhaust emissions from workers' vehicles, heavy construction vehicles, diesel generators, and other equipment to be used during the construction of the proposed EDT facility. These emissions would be similar to those from typical industrial construction projects, and would have negligible impacts on ambient air quality.

Table 3-3. Effects of EDT facility construction on ambient air concentrations of particulate matter at the point of maximum impact ^a

Pollutant and averaging period	Concentration (µg/m ³)				Percent of NAAQS Levels	
	Background ^b	Increment from EDT facility ^c	Total (maximum)	NAAQS value	Total, EDT plus Background	EDT Facility Alone
<i>EDT Facility Using SDC, TDC, or DAVINCH at the Proposed EDT Site (see Figure 2-9):</i>						
PM ₁₀ ^d , 24-hr	36	7	43	150	29%	5%
PM _{2.5} ^d , 24-hr	23	3	26	35	74%	9%
PM _{2.5} ^d , Annual	9	0.04	9	12	75%	0.3%
<i>EDT Facility Using EDS at the Alternate EDT Site (see Figure 2-9):</i>						
PM ₁₀ ^d , 24-hr	36	22	58	150	39%	15%
PM _{2.5} ^d , 24-hr	23	11	34	35	97%	31%
PM _{2.5} ^d , Annual	9	0.2	9.2	12	77%	2%

Notes:^a The point of maximum impact is the location of the highest modeled concentration.^b Background concentrations were obtained from Table 3-2.^c Because the NAAQS allow for one anomalous exceedance of the standard each year, the 24-hr background values for both sizes of particulate matter represent annual second-highest values.^d PM₁₀ is particulate matter equal to or less than 10 µm in diameter; PM_{2.5} is particulate matter equal to or less than 2.5 µm in diameter.**3.1.1.3 Potential air quality impacts during operations**

The proposed EDT facility would use one of the four types of EDT units under review in this EA; that is, the proposed EDT facility would involve the sole use of only one EDT technology. The discharge of atmospheric pollutants would occur from the stack(s) of these EDT systems following off-gas treatment. The number of stacks associated with each type of EDT unit is as follows: (1) For the one SDC unit, there would be a process stack and a ventilation stack for a total of two stacks, (2) each TDC unit has two stacks; hence, the two TDC units would have a total of four stacks, (3) each DAVINCH unit has only one stack; hence the two DAVINCH units would have a total of two stacks, and (4) each EDS unit has its own stack; hence, there would be a total of seven stacks for the seven EDS units.

In the dispersion modeling conducted for this EA, the criteria pollutants were modeled as being emitted from only one hypothetical stack for which any multiple stacks were combined into a single, equivalent stack. This approach is consistent with the one taken in the 2013 human health risk assessment (HHRA) that has been conducted on the emissions from the proposed EDT facility (see Section 3.1.3.1). That is, the multiple stacks were combined into one single hypothetical stack in accord with the rationale discussed in the 2013 HHRA (Franklin 2012, 2013). In the atmospheric dispersion modeling conducted for this EA, the hypothetical stack is considered as a point source of 24-hr continuous emission thereby producing conservative estimates for the bounding assessment. The location and footprint of the proposed EDT facility is shown in Figure 2-9, and a separate dispersion calculation was run for each of the two possible EDT sites.

To simulate the worst-case scenario of impacts to air quality due to stack emissions from the proposed EDT facility, maximum criteria air pollutant concentrations were calculated by using the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) air dispersion model (EPA 2004), as updated in March 2009. The AERMOD calculation was performed using a commercial software package developed by the Lakes Environmental Software Company. The calculation assumes that the modeled chemical species does not participate in chemical reactions in the atmosphere and that atmospheric dispersion is the primary process leading to the change (reduction or dilution) of the emitted pollutant concentration. The modeling domain is patterned after the one developed for use in the 2013 HHRA for the proposed EDT facility (see Section 3.1.3.1). The receptor grid display is illustrated in Figure 3-2 as overlain on the U.S. Geological Survey's digital elevation model (DEM) topographical map of the region. Figure 3-3 shows an example of the AERMOD modeling results for PM₁₀ emitted from the indicated location.

In concert with the atmospheric dispersion modeling conducted as part of the 2013 HHRA for the proposed EDT facility (see Section 3.1.3.1), the hourly meteorological data used as input to the dispersion calculations were based on the 2004 to 2008 on-site surface and upper air data, which are important in determining the vertical extent of pollutant dispersion or mixing height. The use of meteorological data from the period 2004 to 2008—as opposed to the use of more recent data—was intended to provide compatibility between the findings of the air quality analysis in this EA and the 2013 HHRA. The predicted concentrations of criteria pollutants were modeled at the grid resolution of 500 m along the depot boundary and in the surrounding area. The appropriate terrain elevations were assumed and included in the air quality analysis.

The emissions were considered in the analyses are those associated with the destruction of the mustard-filled munitions and their explosive components. Ambient concentrations of the criteria pollutants were estimated by using the total maximum hourly

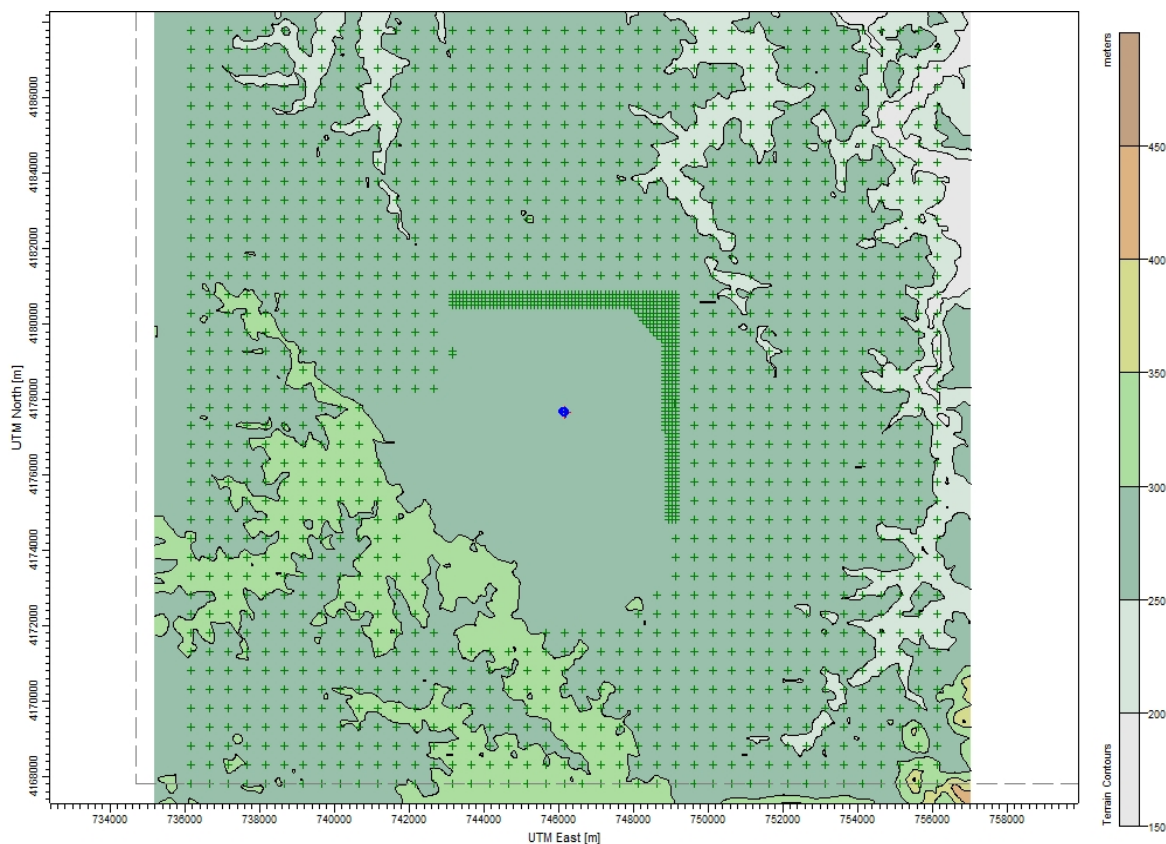


Figure 3-2. Receptor Grid as Used in the Atmospheric Dispersion Modeling Calculations for Potential Impacts to Air Quality.

Note: In this figure, the grid overlays the 75-m resolution contours of the U.S. Geological Survey's digital elevation model (DEM). The blue dot in the center represents the location of the point source used for modeling in this EA. The centrally-located region without any receptor grid points represents the area within the BGAD installation boundaries.

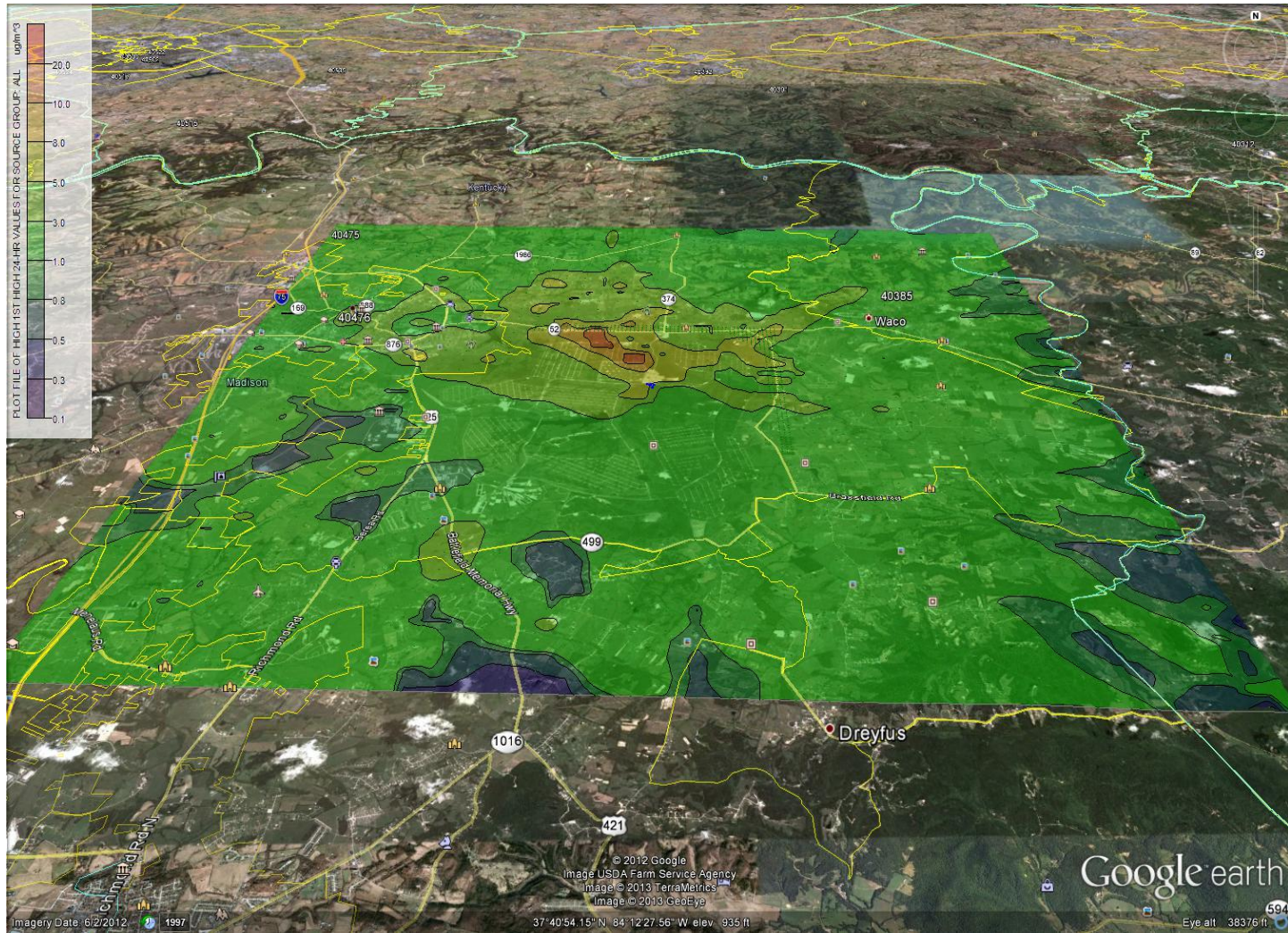


Figure 3-3. Atmospheric Dispersion Modeling Results for Airborne Concentrations of PM₁₀ as Presented in the Google Earth Mapping Domain for Visualization of Potential Impacts to Air Quality.

emission data (in g/s) as provided by the respective EDT unit vendors. For each EDT system, estimates of the maximum concentrations were made for the time period between 2004 and 2008. Since the precise operational schedule for the proposed EDT facility is not yet known, the analysis in this EA assumed the emissions from the EDT unit(s) were continuous for consistency with the 2013 HHRA analysis. The maximum predicted concentrations thus provided the most conservative estimate of the resulting airborne concentration. The percentage of the maximum predicted concentration was then compared to the corresponding NAAQS levels.

For O₃, AERMOD is not designed to model this reactive species, because O₃ is not emitted from a source. Instead, O₃ results from photochemical reactions involving source-emitted precursor gases that include VOCs and oxides of nitrogen. As mentioned previously, there is no routine O₃ monitoring in Madison County. The ambient ozone concentration in the neighboring Fayette County was 92 percent of the NAAQS (see Table 3-2); however, this value is still in compliance. Thus, it is anticipated the hourly O₃ concentration for the county would be expected to be below the NAAQS level. Thus, no effort was made to perform additional analysis for O₃ in this EA using computer models such as the Community Multiscale Air Quality three-dimensional model.

Table 3-4 shows the results of the air quality modeling conducted for this EA, and it displays the incremental contributions at the maximally impacted location for each criteria pollutant as emitted from each of the four types of EDT units. The two possible locations for the proposed EDT facility (as shown in Figure 2-9) were taken into account. The emissions from the proposed EDT facility were modeled for the use of each of the four EDT systems separately (and as explained in greater detail below). The maximum, incremental pollutant concentrations were found to occur at the northern fenceline of the BGAD at a location north of and slightly west of the site of the BGCAPP footprint.

The columns in Table 3-4 display the findings for each type of EDT unit and express the estimated incremental contributions from just the units by themselves (i.e. incremental contributions) as a percentage of the NAAQS levels. As can be seen in Table 3-4, the incremental contributions of the emissions (as a percentage of the NAAQS) from any of the four types of EDT units to airborne concentrations of the criteria pollutant are vanishingly small. The largest percentage contribution (i.e., 16 percent) of the incremental concentration compared to the NAAQS value was found to occur for NO₂ during the 1-hr averaging period for the emissions from the two TDC units. All other concentrations for all other types of EDT units would contribute less than 3 percent of the NAAQS values.

The modeling approach for cumulative impacts is to combine the estimated incremental impacts of the proposed action shown in Table 3-4 with the ambient concentration data shown in Table 3-2. However, because Table 3-4 shows the predicted

Table 3-4. Predicted Maximum Incremental Fenceline Criteria Pollutant Concentrations for the Four EDT Systems.

		SDC		TDC		DAVINCH		EDS	
		Predicted Maximum Concentration	Percent of NAAQS level	Predicted Maximum Concentration	Percent of NAAQS level	Predicted Maximum Concentration	Percent of NAAQS level	Predicted Maximum Concentration	Percent of NAAQS level
Pollutant (Units)	Averaging Time								
NAAQS Primary Standards									
CO (ppm)	8-hr	2.9×10^{-5}	0.0 %	1.2×10^{-3}	0.0 %	0.0	0.0 %	0.0	0.0 %
	1-hr	1.2×10^{-3}	0.0 %	3.8×10^{-3}	0.0 %	0.0	0.0 %	0.0	0.0 %
Pb (µg/m³)	Rolling 3-month avg	9.8×10^{-8}	0.0 %	9.0×10^{-6}	0.0 %	4.3×10^{-10}	0.0 %	3.6×10^{-4}	0.2 %
NO ₂ (ppm)	Annual	1.0×10^{-5}	0.0 %	1.2×10^{-4}	0.2 %	4.1×10^{-6}	0.0 %	5.9×10^{-7}	0.0 %
	1-hr	2.3×10^{-3}	2.3 %	1.6×10^{-2}	16 %	5.4×10^{-4}	0.5 %	4.4×10^{-4}	0.4 %
PM ₁₀ (µg/m³)	24-hr	1.0×10^{-5}	0.0 %	4.3×10^{-1}	0.3 %	1.8×10^{-4}	0.0 %	3.5×10^{-3}	0.0 %
PM _{2.5} (µg/m³)	Annual	1.1×10^{-4}	0.0 %	2.0×10^{-2}	0.2 %	8.3×10^{-6}	0.0 %	8.2×10^{-5}	0.0 %
	24-hr	1.9×10^{-3}	0.0 %	4.3×10^{-1}	1.2 %	1.8×10^{-4}	0.0 %	3.5×10^{-3}	0.0 %
SO ₂ (ppm)	1-hr	2.9×10^{-5}	0.0 %	2.0×10^{-3}	2.6 %	8.7×10^{-7}	0.0 %	1.8×10^{-3}	2.4 %
NAAQS Secondary Standards ^a									
PM _{2.5} (µg/m³)	Annual	1.1×10^{-4}	0.0 %	2.0×10^{-2}	0.1 %	8.3×10^{-6}	0.0 %	8.2×10^{-5}	0.0 %
SO ₂ (ppm)	3-hr	1.2×10^{-5}	0.0 %	1.1×10^{-3}	0.2 %	4.8×10^{-7}	0.0 %	6.0×10^{-4}	0.1 %

^a The NAAQS secondary standards are the same as the NAAQS primary standards for the following criteria pollutants and averaging periods: CO, 1-hr average; Pb, rolling 3-month average; NO₂, annual average; PM₁₀, 24-hr average; and PM_{2.5}, 24-hr average

incremental concentrations for each of the criteria pollutants would be only a small fraction of the corresponding NAAQS levels, the cumulative impacts to air quality due to the emissions from any of the four types of EDT systems would likewise be small in comparison to the NAAQS levels. Hence, no further tabulation of the numerical results for the cumulative impacts has been made in this EA.

An EDT Facility That Uses the SDC Unit. The operation of a single SDC unit was modeled. As shown in Table 3-4 for the incremental impacts, and as discussed above for the cumulative impacts, negligible impact to air quality would be expected to occur during the operation of an EDT facility employing the SDC unit. That is, the emissions from an EDT facility that used the SDC unit would contribute negligibly to ambient background concentrations, and no exceedance of the NAAQS levels for any of the criteria pollutants would be expected for any averaging period for either the primary or secondary NAAQS. Thus, the emissions from all potential sources for the SDC unit would be anticipated to have negligible impacts on air quality.

An EDT Facility That Uses the TDC Unit. The operation of the two TDC units was modeled for simultaneous emissions. As shown in Table 3-4 for the incremental impacts, and as discussed above for the cumulative impacts, negligible impact to air quality would be expected to occur during the operation of an EDT facility employing two TDC units. That is, the emissions from an EDT facility that used two TDC units would contribute negligibly to ambient background concentrations (except for a 16% contribution to the 1-hr standard for NO₂), and no exceedance of the NAAQS levels for any of the criteria pollutants would be expected for any averaging period for either the primary or secondary NAAQS. Thus, the emissions from all potential sources for the two TDC units would be anticipated to have no significant impacts on air quality.

An EDT Facility That Uses the DAVINCH Unit. The operation of two DAVINCH systems was modeled. As shown in Table 3-4 for the incremental impacts and as discussed above for the cumulative impacts, negligible impact to air quality would be expected to occur during the operation of an EDT facility employing two DAVINCH units. That is, the emissions from an EDT facility that used two DAVINCH units would contribute negligibly to ambient background concentrations, and no exceedance of the NAAQS levels for any of the criteria pollutants would be expected for any averaging period for either the primary or secondary NAAQS. Thus, the emissions from all potential sources for the two DAVINCH units would be anticipated to have negligible impacts on air quality.

An EDT Facility That Uses the EDS Unit. The emissions associated with operation of seven EDS units, operating simultaneously, were modeled to represent the worst-case scenario of the emissions from the proposed EDS units. As shown in Table 3-4 for the incremental impacts, and as discussed above for the cumulative impacts, negligible impact to air quality would be expected to occur during the operation of an EDT facility employing seven EDS units. That is, the emissions from an EDT facility that used seven EDS units would contribute negligibly to ambient background concentrations, and no exceedance of the NAAQS levels for any of the criteria pollutants would be expected for any averaging period for either the primary or secondary NAAQS. Thus, the emissions from all potential sources for the seven EDS units would be anticipated to have negligible impacts on air quality.

Regulated Pollutants. The emissions of pollutants at the BGAD and at the BGCAPP are regulated under Title V air permits issued by the KDEP, and the emissions from the proposed EDT facility would likewise be regulated. There are separate air permits for the site-wide emissions at the BGAD (KDEP 2012a) and for the emissions at the BGCAPP (KDEP 2012b); however, the allowable tons/year emission limits specified in the two permits apply to the combined BGAD site-wide emissions and the BGCAPP emissions.

Table 3-5 shows the emission limits as specified in the permits for the regulated pollutants, which include VOCs and hazardous air pollutants (HAPs). The table also shows the quantities of regulated pollutants that would be emitted from each type of EDT system during its lifetime (i.e., the proposed EDT facility is assumed to be operational only during a single year). Table 3-5 also shows the thresholds for “significant” emissions from major sources as defined under 40 CFR 51.166(b)(23)(i) for the prevention of significant deterioration (PSD) of air quality. As can be seen from Table 3-5, the annual emissions from an EDT facility that uses any of the four types of EDT units would be well below the PSD significance levels and would be far below the limits specified in the existing air permits.

3.1.1.4 Greenhouse Gas Emissions

The emission of carbon dioxide (CO₂) and other greenhouse gases (GHGs) from either the BGCAPP or the proposed EDT facility have not been quantified. Nevertheless, this subsection provides perspective on such emissions in relation to GHG emissions from other sources.

As discussed in the state of the science report issued by the U.S. Global Change Research Program (GCRP), it is the “. . . production and use of energy that is the primary cause of global warming, and in turn, climate change will eventually affect our production and use of energy. The vast majority of U.S. greenhouse gas emissions, about 87 percent,

**Table 3-5. Potential Annual Emissions from the Proposed EDT Facility and from Other Sources at the BGAD
(in tons per year)**

Pollutant	Type of EDT System ^a				PSD Significance Levels ^b	Total Allowable under Existing Title V Air Permits ^c
	SDC (1 unit)	TDC (2 units)	DAVINCH (2 units)	EDS (7 units)		
PM (includes PM ₁₀ and PM _{2.5})	0.003	0.34	< 0.001	0.001	25	N/A
SO ₂	0.009	0.68	< 0.001	0.042	40	N/A
NO _x	0.51	4.0	0.057	0.008	40	225
CO	0.019	0.58	0 ^d	0 ^d	100	225
Lead (Pb)	< 0.001	< 0.001	< 0.001	0.001	0.6	N/A
VOCs ^e	0.001	3.8	< 0.001	1.0	40	90
Combined HAPs ^f	0.002	4.1	0.049	1.0	N/A	22.5
Metals and Inorganics ^g	0.001	0.37	0.048	0.004	N/A	N/A

Notes:

N/A = Not applicable.

^a The entire campaign at the proposed EDT facility is assumed to be completed within one year; hence, the lifetime emissions of each type of EDT system are included in the above table.

^b The significance levels for the Prevention of Significant Deterioration (PSD) of air quality are defined in 40 CFR 51.166(b)(23)(i).

^c The allowable tons/year emission rates specified in the two Title V air permits apply to the combined BGAD site-wide emissions and the BGCAPP emissions. BGAD site-wide values obtained from Kentucky Department for Environmental Protection, *Draft Air Quality Permit V-12-037 for Blue Grass Army Depot*, Frankfort, Ky., March 2, 2012. BGCAPP values obtained from Kentucky Department for Environmental Protection, *Final Air Quality Permit V-10-023 (Revision 1) for Blue Grass Chemical Agent-Destruction Pilot Plant*, Frankfort, Ky., June 14, 2012.

^d The specified type of EDT system does not emit this particular pollutant.

^e The emissions of volatile organic compounds (VOCs) are computed here as the sum of emissions from each of the chemicals of potential concern (COPCs) listed in Table A-2 in Appendix A of this EA that are not identified as “inorganic,” regardless of whether they might be classified as volatile and/or organic.

^f The emissions of combined hazardous air pollutants (HAPs) are computed here as the sum of emissions from each of the chemicals of potential concern (COPCs) listed in in Table A-2 in Appendix A of this EA, regardless of whether they might be classified as HAPs.

^g The emissions of metals and inorganics are computed here as the sum of emissions from each of the COPCs listed in Table A-2 in Appendix A of this EA that are identified as “inorganic.”

come from energy production and use” Approximately one-third of the GHG emissions in the United States are associated with the combustion of fossil fuels to generate electricity and heat (Karl et al. 2009), and additional GHG emissions are associated with the exhaust from the internal combustion engines used in transportation vehicles.

The cumulative impacts of a single source or combination of GHG emission sources would need to be evaluated and considered in context because:

- The impact is global rather than local or regional;
- The impact is not particularly sensitive to the location of the release point;
- The magnitude of individual GHG sources related to human activity, no matter how large compared to other sources, is small when compared to the total mass of GHGs that exist in the atmosphere; and
- The total number and variety of GHG emission sources are extremely large and are ubiquitous.

The above points are illustrated by the comparison of annual emission rates of CO₂, one of the principal GHGs, as shown in Table 3-6.

An evaluation of cumulative impacts of GHG emissions would require the use of a global climate model. The GCRP report referenced above (Karl et al. 2009) provides a synthesis of the results of numerous climate modeling studies; hence, the cumulative impacts of GHG emissions around the world as presented in the GCRP report provide an appropriate basis for the evaluation of cumulative impacts.

If all the carbon in the mustard agent in storage at the BGAD—as well as all the carbon in the 155mm projectiles’ explosive components—were to become CO₂ and were to be released from the proposed EDT facility, then approximately 110 tons of CO₂ would be released into the atmosphere. As can be seen from Table 3-6, this amount of CO₂ would be roughly equivalent to the annual emissions from twenty U.S. automobiles. Furthermore, if all the carbon contained in the nerve agents and munitions to be processed in the BGCAPP (and in their explosive components), were to become CO₂ and were to be released from the BGCAPP, then a total of approximately 1700 tons of CO₂ would be released. This amount of CO₂ would be roughly equivalent to the annual emissions from 325 U.S. automobiles.

Based on the impacts set forth in the GCRP report, and on the relative magnitude of CO₂ emissions shown in Table 3-6, it can be concluded that the national and worldwide cumulative impacts of GHG emissions are potentially significant, with or without the contribution of GHG emissions from the proposed EDT facility or from the BGCAPP.

The emission of GHG associated with the proposed EDT facility would therefore not contribute any significant impacts as related to overall atmospheric CO₂ concentrations, global warming, or climate change.

Table 3-6. Comparison of Annual Carbon Dioxide (CO₂) Emissions from Fossil Fuel Combustion.

Source	Metric Tons per Year
Global Emissions	3.0×10^{10} ^(a)
United States	5.4×10^9 ^(a)
Commonwealth of Kentucky	1.5×10^8 ^(b)
Average U.S. Passenger Vehicle	5.2 ^(c)

Note: 1 metric ton = 1.1 U.S. tons (at 2,000 pounds per U.S. ton)

Sources:

(a) U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010; Executive Summary*, EPA 430-R-12-001, Office of Atmospheric Programs, Washington, D.C., April 2012; Available on-line at <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-ES.pdf>

(b) U.S. Environmental Protection Agency, *State Energy CO₂ Emissions*, State and Local Climate and Energy Program, Washington, D.C., August 2012; Available on-line at http://www.epa.gov/statelocalclimate/resources/state_energyco2inv.html

(c) U.S. Environmental Protection Agency, *Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle*, EPA420-F-05-004, Office of Transportation and Air Quality, Washington, D.C., February 2005.

3.1.1.5 Conclusions regarding air quality impacts

The air quality modeling analysis conducted for this EA shows that an EDT facility with any one of the four EDT systems would produce no significant impacts on the ambient air quality at the BGAD installation boundary during both the construction and the operation of the proposed facility. Air quality impacts within the larger region around the BGAD would be even smaller in magnitude. The percentage contributions to the primary and secondary NAAQS for all criteria pollutants during the operation of the proposed EDT

facility with any of the four EDT systems were modeled and were found not to be significant. Contributions of GHG emissions from the proposed EDT facility in conjunction with the emissions anticipated from the BGCAPP would also be insignificant in comparison to other sources of such emissions within Kentucky, within the United States, and throughout the world.

In conclusion, the impacts to air quality—as measured by the predicted effects on ambient air concentrations of pollutants regulated by the NAAQS—are expected to be minor for an EDT facility that uses any of the four EDT systems.

3.1.2 Water Resources

Withdrawal of groundwater at the BGAD is negligible, since it is conducted only as part of the monitoring of old solid waste management units. Potential impacts to groundwater resources at the BGAD are minimized through the implementation of the existing depot-wide Groundwater Protection Plan (BGAD 2012); however, as discussed in the introduction to Section 3, there would be no anticipated impacts to groundwater resources in conjunction with the implementation of the proposed action. Therefore, groundwater resources are not discussed further in this EA.

As described below in Section 3.1.2.1, several measures would be implemented to prevent impacts to surface water resources during the construction of the proposed EDT facility. Beginning with Section 3.1.2.2, the remainder of this subsection focuses on potential impacts to surface water resources due to the implementation of the proposed action.

3.1.2.1 Potential impacts during construction

Potential impacts to water resources during construction of the proposed EDT facility would be minimized or mitigated through implementation of the Storm Water Pollution Prevention Plan (SWPPP; see Section 2.1.5) in concert with Executive Order 13514 as implemented by DOD (2010). The DOD guidance specifies the requirements for reducing the impacts of storm water runoff associated with new construction. The SWPPP for the BGCAPP describes best management practices (BMPs) that would be designed to minimize the impacts of erosion and/or sedimentation on adjacent ground and any receiving waters. The BMPs for the construction of the proposed EDT facility would be expected to be similar to those for the BGCAPP.

The BMPs would minimize the impacts of erosion and/or sedimentation by diverting flows from exposed soil, detaining storm water runoff, and reducing runoff and the discharge of pollutants from exposed areas of the project. The storm water detention basin, check dams,

and other BMPs intended to trap sediment on site would be constructed as one of the first steps during site excavation and grading. Perimeter BMPs would be installed before other land-disturbing activities begin. These perimeter controls may include physical structures (such as fencing) or temporary structures (such as silt fences) to control the area where construction activities will occur.

Other potential BMPs for the construction of the proposed EDT facility typically include the following activities and measures:

- Marking clearing limits in order to preserve existing vegetation;
- Minimizing off-site vehicle tracking of sediments;
- Use of a storm water detention basin to capture sediment during construction activities;
- Construction of check dams at appropriate intervals within ditches or swales that drain disturbed areas;
- Use of silt fences, erosion logs, and straw bale barriers around construction areas;
- Protection of storm drain inlets to reduce sediment accumulation;
- Stabilization of soil (after final grading) with gravel, compactable soil, mulch, seeding or chemical stabilizers to control dust and to reduce sediment runoff;
- Use of dust control measures (such as application of water to disturbed areas);
- Stabilization of slopes and the use of slope drains; and
- Post-construction erosion and sediment controls.

3.1.2.2 Existing surface water resources and existing water treatment facilities at the BGAD

Surface Water Resources. The BGAD is located within the Kentucky River basin and is drained by headwater tributaries of Big Muddy Creek, Otter Creek, and Silver Creek. Most streams on BGAD flow intermittently and are dry during late-summer and early-fall. Many pools are present throughout the BGAD.

Four streams drain the majority of the BGAD: (1) Muddy Creek enters the depot at its southeastern corner, flows in a northerly direction, and then exits at the depot's eastern boundary; (2) an unnamed tributary of Hays Fork Creek flows in a southwesterly direction into Silver Creek outside the BGAD boundaries; (3) Little Muddy Creek flows in an easterly direction and flows into Muddy Creek within the depot boundaries; and (4) Viny Fork flows

in a northerly direction parallel to and east of Muddy Creek and flows into Big Muddy Creek (Stout et al. 2010).

Otter Creek and Silver Creek tributaries are second-order streams within the BGAD, and Muddy Creek is a third-order stream. These streams generally are shallow (i.e., less than 3 ft deep), have a maximum width of 15 to 30 ft, and are characterized by short, shallow riffles and long pools. Muddy Creek is a first priority impaired stream; hence, it cannot support swimming due to pathogens from suspected grazing-related sources. The impaired stream segment of Muddy Creek includes portions flowing through the BGAD (Stout et al. 2010).

The largest surface water feature at the BGAD is Lake Vega, a 135-acre impoundment of Little Muddy Creek (located upstream from the confluence of Little Muddy Creek and Muddy Creek). Lake Vega is located in approximately the center of the depot and is wholly contained within the depot boundaries. Two other large water bodies are located wholly within the BGAD boundaries: Lake Gem (35 acres) and Lake Buck (15 acres), both of which are in the southwestern portion of the depot and both of which were created by impoundments of Silver Creek tributaries (Stout et al. 2010).

BGAD Facilities. The BGAD obtains its water from Lake Vega. The normal pool storage capacity of Lake Vega has been estimated as 507 million gal (1557 ac-ft) (Stout et al. 2010). Prior to its on-site use at the BGAD, the water withdrawn from Lake Vega is treated in the depot's water treatment plant, which has a capacity of 720,000 gal/day (i.e., 263 million gal/yr or 806 ac-ft/yr). For the most recent years for which data are available, the water treatment plant produced 73.4 million gal (225 ac-ft) in 2010 and 68.7 million gal (211 ac-ft) in 2011, which represents 28 percent and 26 percent of capacity, respectively.

The depot operates a single wastewater treatment plant. The BGAD's sanitary sewer system collects domestic sewage from latrines, showers, and other sanitary facilities. The sewage is treated at the depot's treatment plant which has a capacity of 374,000 gal/day. Treated effluent from the plant is discharged into the aforementioned unnamed tributary of Hays Fork.

3.1.2.3 Surface water usage requirements

During construction of the proposed EDT facility, water would be used for the preparation of concrete; for dust suppression on unpaved surfaces where construction vehicles would travel; and for rinsing or cleaning equipment, structures, and materials. No estimate of the quantity of water needed for these activities is currently available; however, the anticipated quantity would be small in comparison to the quantities of water

needed for similar construction activities at the BGCAPP. The consumption of water for construction of the proposed EDT facility would therefore not be expected to create any significant water-use impacts.

The primary impacts from water use at the proposed EDT facility would be associated with the process water needed for operation of the facility and with the non-process water required to support the facility. Chemicals for use with any of the four types of EDT units would arrive at the EDT facility pre-mixed; hence, no additional water would be required for these chemicals. Table 3-7 shows the process water requirements for each type of EDT unit under consideration for the proposed EDT facility. Each entry in the table represents the respective vendor's estimates of the quantities of water needed for the preparation or rinsing of the explosive containment chamber and for any off-gas treatment systems (such as scrubbers).

The water usage estimates in Table 3-7 are based on the operational lifetime of the proposed EDT facility; however, because the analysis in this section focuses on annual water use, the entire amount of water used during the operational lifetime of the proposed EDT facility is therefore assumed to be consumed during a single year. However, it should be noted that neither the SDC system nor the TDC system generate any liquid waste during operations, since all of the process water used by these two systems is exhausted out the stack in the form of water vapor.

Table 3-7. Process Water Requirements for the Proposed EDT Facility.

Type of EDT Unit	Rate of Water Use per EDT Unit ^a	Annual Water Requirement (gal) ^b
SDC	21 gal/hr	145,000
TDC	32 gal/day	19,000 ^{c,d}
DAVINCH	46 gal/day	26,000 ^c
EDS	53 gal/detonation	183,000 ^e

Notes:

^a Source data provided by the respective EDT unit vendors.

^b Assumes operation for 9.5 months at 24-hr per day, 7 days per week, except for each of the EDS units which are assumed to operate only 6 days per week.

^c Includes consideration that a total of two units would be used in the proposed EDT facility.

^d Includes 360 gal per unit (one-time use only) for the TDC system's chiller.

^e Includes consideration that a total of seven EDS units would be used in the proposed EDT facility; Two detonations in each EDS unit are assumed to occur daily.

The EDS unit would require the use of 183,000 gal (0.6 ac-ft) of process water annually, and this is the largest number in Table 3-7. For the purpose of analysis in the remainder of this subsection, the process water requirement for the EDS is used to bound the potential surface water usage impacts.

Additional, non-process water would be used by the EDT workers for drinking, cleanup, showers, and toilets. The operating crew for the seven EDS units would be the largest of any of the four types of EDT units under study in this EA. Up to approximately 120 operators and 90 support personnel would be required for the daily operation of the multiple EDS units. Assuming 10 gal/day per person for the support personnel and 15 gal/day for the operators (who may take a shower after their shift), the non-process water use for the proposed EDT facility could be up to 2700 gal/day or 770,000 gal (2.4 ac-ft) over the facility's operational lifetime.

The upper bound on the combined total quantity of water required during the operation of the proposed EDT facility would therefore be 953,000 gal (which is equal to 183,000 gal of process water, plus 770,000 gal of non-process water) or 2.9 ac-ft. This would equate to about 3,300 gal/day over the operational lifetime of the proposed EDT facility.

3.1.2.4 Potential impacts to surface water resources

Based on the numerical data presented in Section 3.1.2.3 regarding the estimated quantities of process water plus non-process water required by the proposed EDT facility, the total amount of water to be used by that facility would be only a small fraction (about 1 percent) of the current annual water use at the BGAD. That is, a proposed additional usage of 953,000 gal/yr (2.9 ac-ft/yr) compared to depot-wide usage of 73.4 million gal/yr (225 ac-ft/yr) in 2010.

Cumulative impacts can be examined by combining the water usage of the proposed EDT facility with that of the BGCAPP as if both facilities were in operation at the same time. Section 4.3.2 of the 2002 FEIS (PMCD 2002) provides the BGCAPP's projected water usage as 12.7 million gal/yr (39 ac-ft/yr), which is composed of 6.3 million gal/yr of process water and 6.4 million gal/yr of non-process water. When the anticipated water usage for the proposed EDT facility [953,000 gal/yr (2.9 ac-ft/yr)] is added to the water usage for the BGCAPP, the resulting value of 13.7 million gal/yr (42 ac-ft/yr) would only be about 5 percent of the existing capacity [263 million gal/yr (806 ac-ft/yr)] of the BGAD's water treatment plant.

If the existing BGAD water use of 73.4 million gal/yr (225 ac-ft/yr) were to continue while both the BGCAPP and the proposed EDT facility were in simultaneous operation, the combined total consumption of all water used at the BGAD would become 87.1 million gal/yr (267 ac-ft/yr). This combined quantity is about 33 percent of the existing

capacity of the BGAD's water treatment plant, and would be equivalent to only about 17 percent of the normal pool capacity [507 million gal (1557 ac-ft)] of Lake Vega.

Therefore, adequate quantities of water would be available to support the operation of both the BGCAPP and the proposed EDT facility simultaneously, as well as the other users of water at the BGAD. Furthermore, because the BGCAPP and the proposed EDT facility are each expected to be in operation for less than five years, any overall impacts to water supplies would therefore be temporary and minor, if observable at all.

3.1.2.5 Conclusions about impacts to surface water resources

The anticipated quantity of water needed during the construction of the proposed EDT facility would be small in comparison to the quantity of water needed for similar construction activities at the BGCAPP. The use of water for construction of the proposed EDT facility would therefore not be expected to create any significant impacts to water supplies.

The primary impacts from water use at the proposed EDT facility would be associated with the quantities of process water needed for operation of the facility and non-process water required to support the facility. The process water requirement for the multiple EDS units, as shown in Table 3-7, has been used to bound the potential impacts to surface water resources. The largest non-process water requirement would be associated with the seven EDS units, and the combined process water and non-process water requirement of the proposed EDT facility would be bounded by a consumption rate of 953,000 gal/yr (2.9 ac-ft/yr). This amount represents only about 1 percent of the current annual water use at the BGAD.

In regard to cumulative impacts, the combined water use of the BGCAPP and the proposed EDT facility would be 13.7 million gal/yr (42 ac-ft/yr) which is about 5 percent of the existing capacity of the BGAD's water treatment plant. If the existing BGAD water use were to continue while both the BGCAPP and the proposed EDT facility were in simultaneous operation, the combined total consumption of all water used at the BGAD would become 87.1 million gal/yr (267 ac-ft/yr). This combined quantity is about 33 percent of the existing capacity of the BGAD's water treatment plant, and would be equivalent to only about 17 percent of the normal pool capacity of Lake Vega.

Thus, adequate water supplies exist to support the operation of both the BGCAPP and the proposed EDT facility if they were to be in operation during the same time period. Because the BGCAPP and the proposed EDT facility are each expected to be in operation for less than five years, any overall impacts to water supplies would therefore be temporary and minor, if observable at all.

Based on the above considerations, it is concluded that no significant impacts to surface water resources would occur during either the construction or the operation of the proposed EDT facility.

3.1.3 Human Health and Safety

Potential impacts to human health could occur during either the construction or the operation of the proposed EDT facility. This subsection provides an assessment of such impacts. Section 3.1.3.1 provides an overview and a summary of the findings of the human health risk assessment that has been conducted on the anticipated emissions during the operational lifetime of the proposed EDT facility. Section 3.1.3.2 provides a discussion of potential health impacts to the workers constructing and/or operating the facility, and Section 3.1.3.3 discusses potential accidents.

3.1.3.1 Human health risk assessment

As part of the permitting requirements of the Kentucky Department for Environmental Protection (KDEP), the Army undertook the development of a human health risk assessment on the emissions associated with the operation of the BGCAPP. A health risk assessment protocol specific to the BGCAPP was developed and submitted by the Army to the KDEP. The protocol was approved by the KDEP, as were the numerical thresholds of the acceptable levels of risk. In accordance with the protocol, a screening-level human health risk assessment (SLHHRA) for the BGCAPP was prepared and submitted to the KDEP (Franklin 2011).

In conjunction with the proposed action evaluated in this current EA, an additional human health risk assessment (HHRA) has been developed on the emissions from each of the four types of EDT units (Franklin 2012, 2013). The remainder of this subsection provides an overview of the 2011 SLHHRA for the BGCAPP—which serves as the basis for the 2013 HHRA for the proposed EDT facility—and it provides a summary of the findings from both studies. This subsection also describes the cumulative risks of the proposed EDT facility in simultaneous operation with the BGCAPP; however, the BGCAPP risks must first be described and presented.

The 2011 SLHHRA for the BGCAPP. The objective of the 2011 SLHHRA was to evaluate the anticipated emissions from the BGCAPP and to estimate the potential impacts of those emissions to human health in the region around the BGAD. To achieve this objective, the 2011 SLHHRA (1) evaluated how chemicals reasonably expected to be present in the air

emissions from the BGCAPP could be transported through the environment and into the food chain, (2) assessed the exposure pathways and scenarios by which different hypothetical human receptors could directly or indirectly come into contact with these chemicals, and (3) calculated the numerical risks and hazards associated with each exposure scenario.

The 2011 SLHHRA considered human exposures to chemical compounds emitted from the BGCAPP and included pathways for both direct exposure (through inhalation) and indirect exposure (i.e., through soil, surface water, and food products potentially impacted by atmospheric emissions and by the deposition therefrom) for 58 chemicals of potential concern (COPCs). These COPCs were identified from literature, available data from sources similar to the BGCAPP, and from bench-scale evaluations of the processes to be used at the BGCAPP.

The methodology employed in the 2011 SLHHRA was based on guidance from the U.S. Environmental Protection Agency (EPA) risk assessment guidance (EPA 2005a) and EPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W). The following summary provides additional details on the method and approach used in the 2011 SLHHRA.

- An estimated numerical emission rate was determined for each COPC from each stack at the BGCAPP.
- An air pollutant dispersion model (namely AERMOD, as recommended by the EPA) was then used to quantify atmospheric concentrations and deposition rates of the emitted COPCs for a grid of selected locations around the facility.
- The predicted media concentrations at off-site locations were used to evaluate exposure to human receptors under different exposure scenarios. As a conservative approach, the maximum total COPC-specific air concentrations and deposition rates were used to calculate exposure, even though such maximum air concentrations and maximum deposition values might be predicted to occur at different locations for each COPC.
- A conceptual site-specific model was developed to identify the various pathways by which human receptors might be potentially exposed to the emitted COPCs. This included evaluation of scenarios involving either chronic (long-term) exposure or acute (short-term) exposure. The COPC concentrations in the various exposure media (e.g., air, soil, water, food) were then used in calculations to quantify exposure to each COPC for the identified human receptor under each exposure pathway.
- Direct exposure to COPCs via inhalation was evaluated for all receptors. Indirect exposure as a result of continued, long-term exposure to contaminated soil, surface water, and food was evaluated for the off-site receptors for durations up to 70 years.

- The toxicity assessment weighed the available evidence regarding the potential for particular chemicals to cause adverse effects (both carcinogenic and non-carcinogenic) in a hypothetical exposed individual. Toxicity values were selected for each COPC using the hierarchical approaches recommended by the EPA.

The three types of hypothetical human receptors for the analysis included: (a) a nearby adult farmer, (b) a nearby adult resident, and (c) a nearby adult fisher. The exposure pathways for each of these types of hypothetical individuals are described in the following paragraphs.

The **farmer** was assumed to be physically located off-site but near the BGAD continuously for up to 40 years, during which time he/she would receive direct inhalation exposure from the BGCAPP. The diet of the farmer was assumed to consist entirely of foodstuffs produced on the land with the highest computed deposition rate. This includes fruits and vegetables, beef, pork, milk, poultry, and eggs; but not fish. In addition, the farmer was assumed to obtain all of his/her water from the surface water body located at the point with the highest computed deposition rate.

The exposure scenario for the **resident** was similar to that for the farmer, except that the resident was assumed to be exposed continuously for up to 30 years. In addition, the resident was assumed to obtain no locally produced beef, pork, milk, poultry, eggs or fish. That is, these foodstuffs were assumed to come from distant regions where emissions from the BGCAPP would not affect the air, soil or water.

The exposure for the **fisher** was similar to that for the resident, except that the fisher was assumed to consume fish obtained from a local water body that had been impacted by BGCAPP operations.

For each of the three types of hypothetical human receptors listed above, the following exposure scenarios were evaluated in the 2011 SLHHRA for the BGCAPP.

- An **adult** exposure scenario was based on the assumptions and exposure pathways described in the above paragraphs for each of the hypothetical human receptors.
- A **child** exposure scenario was based on the assumption that the child is physically located at the impacted location continuously for the first six years of his/her life. These six years were assumed to coincide with the operational period for the BGCAPP. The child was assumed to receive direct exposure through inhalation of BGCAPP emissions, as well as indirect exposure to the same pathways and contaminated foodstuffs as for the respective hypothetical adult receptors described in the above paragraphs. That is, the 2011 SLHHRA included an assessment of the potential risks to a child of the farmer, a child of the resident, and a child of the fisher.

For the purposes of the 2011 SLHHRA, the farmer and fisher scenarios would be expected to represent the maximum exposure scenarios. That is, the exposure parameters used in the farmer scenarios were all equal to or greater than those for all other exposure scenarios in all categories except for fish consumption, which is highest for the fisher scenarios. The farmer scenarios would be expected to result in the highest risk due to higher ingestion rates of contaminated produce and terrestrial animal products. However, if the concentrations of the risk-driving chemicals are significantly higher in fish than in produce and terrestrial animal products, the fisher scenarios could result in the highest risk.

The calculations in the 2011 SLHHRA combined the results of the exposure assessment (i.e., dose assessment) with information about the toxicity of each COPC in order to describe the types of risk and the associated numerical magnitudes of those risks. The assessment of risk in the 2011 SLHHRA included the following three measures of risk:

- ***Excess individual lifetime cancer risk***, which is estimated as the incremental probability of an individual developing cancer over his/her lifetime as a result of exposure to a potential carcinogen released from the BGCAPP. For each hypothetical human receptor and for each exposure scenario, the computed total carcinogenic risk was compared to the KDEP acceptable level of one case in one-hundred thousand (also expressed as 1/100,000 or $1.0\text{E-}05$ or 1×10^{-5}).
- ***Chronic (i.e., long-term) non-carcinogenic risk***, which is an indication of the potential for non-carcinogenic toxicity to occur in an exposed individual as evaluated by comparing the estimated exposure level over a specified time period (e.g., a 70-year lifetime) with the appropriate non-cancer toxicity value. The resulting non-carcinogenic hazard quotient (HQ) assumes that for each COPC there is a level of exposure below which it is unlikely for even sensitive subpopulations to experience adverse health effects. HQ values represent the non-carcinogenic hazard associated with a single COPC and a specific exposure pathway. The direct-inhalation HQs for each COPC were summed to calculate an inhalation hazard index (HI) value. Indirect HQs for each COPC were summed to calculate the indirect HI. The HI represents total non-carcinogenic hazard from all COPCs a human receptor may be exposed to by a particular exposure pathway. The total HI value was then calculated by summing the individual pathway HI values for a given human receptor. The computed total non-carcinogenic HI value was compared to the KDEP acceptable HI value of 0.25.
- ***Acute (i.e., short-term) inhalation hazard***, which is an indication of the potential for airborne COPCs to create adverse human health effects. The acute HQ represents the hazard associated with short-term direct exposure to each COPC in air during a short-term emission release event. Unlike the HQ for direct exposures from chronic (i.e., long-

term) exposures, which are based on the amount of COPC inhaled, the calculation of the acute HQ value is based on the air concentration of COPC to which a human receptor is exposed. The acute HQ values for each COPC were summed to calculate the overall acute HI. The computed acute inhalation HI value was compared to the KDEP acceptable HI value of 0.25.

Following completion of the 2011 SLHHRA and its approval by the KDEP, additional information was discovered in the fall of 2012 indicating hydrogen cyanide might be produced and released from portions of the BGCAPP process. The risks associated with these previously unknown hydrogen cyanide releases were not included in the 2011 SLHHRA. An engineering evaluation is ongoing with the objective of making process changes to eliminate the release of hydrogen cyanide from the BGCAPP. Testing of process changes to eliminate these releases is not expected before the end of 2013.

2011 SLHHRA Findings. The results of the 2011 SLHHRA demonstrated that the emissions from the BGCAPP would be expected to meet all acceptable risk thresholds. The findings are summarized below. The actual numerical values are presented later in this subsection, in comparison to the numerical risk values for the proposed EDT facility.

- The *excess individual lifetime cancer risk* to any human receptor was found to be 55 times lower than the KDEP acceptable risk level of 1×10^{-5} . The adult farmer represented the hypothetical individual with the greatest lifetime cancer risk associated with the emissions from the BGCAPP. The individual COPC that provided the greatest contribution to this lifetime cancer risk was mustard agent.
- The *chronic (i.e., long-term) non-carcinogenic risk*—as measured by the combined HI—to any human receptor was found to be 20 times lower than the KDEP acceptable level of 0.25. The child of the farmer represented the hypothetical individual with the greatest chronic non-carcinogenic risk associated with the emissions from the BGCAPP. The individual COPC that provided the greatest contribution to this non-cancer risk was mercury.
- The *acute (i.e., short-term) inhalation hazard* for the emissions from the BGCAPP—as measured by the acute HI—was found to be about 10 times lower than the KDEP acceptable level of 0.25. The individual COPC that provided the greatest contribution to this acute HI was mustard agent.

The 2013 HHRA for the Four EDT Systems. As discussed earlier, the Army commissioned an HHRA for each of the four EDT systems to support the analyses in this EA

(Franklin 2012, 2013). In most cases, the methods used in the 2013 HHRA for the proposed EDT facility were the same as those for the 2011 SLHHRA for the BGCAPP. Some differences did exist, however, due primarily to the emission characteristics of the four types of EDT units and the inclusion of COPCs that were not present in the BGCAPP emissions. The following list describes the similarities and differences between the two health risk assessments.

- The 2013 HHRA evaluated four separate hypothetical EDT facilities, each using a separate type of EDT unit. The proposed EDT facility was assumed to consist of either one SDC unit, two TDC units, two DAVINCH units, or seven EDS units. The 2013 HHRA included the appropriate stack parameters for each of the four hypothetical EDT facilities; however, with the exception of the SDC option (which includes a building vent in addition to the process stack), only a single stack was assumed for each such facility.
- For the separate hypothetical EDT facilities using the SDC unit, the TDC units, or the DAVINCH units, the location of the source of stack emissions was the proposed EDT site (as shown in Figure 2-9), and the alternate EDT site (as shown in Figure 2-9) was used as the location for the source of emissions for an EDT facility using the multiple EDS units.
- A list of COPCs was developed for the 2013 HHRA for each type of EDT unit. The COPCs included metals (such as mercury, arsenic, and lead) and dioxins/furans, as well as other COPCs that were not included in the 2011 SLHHRA for the BGCAPP. A total of 77 COPCs was evaluated for the four types of EDT units in the 2013 HHRA. Additional information about the specific COPCs used in the 2011 SLHHRA for the BGCAPP and in the 2013 HHRA for the EDT units can be found in Appendix A of this EA.
- A set of COPC-specific emission rates was developed for the 2013 HHRA for each type of EDT unit using the best available information (usually derived from actual testing of the EDT unit). As discussed in Appendix A of this EA, the COPC-specific emission rates are presented in a report by ERM Consulting Services (ERM 2013); however, the emissions rates are not repeated in this EA due to the large volume of those data.
- The atmospheric dispersion modeling for the 2013 HHRA used the latest version of the EPA-approved AERMOD model. The five-year set of BGAD on-site meteorological data that was used in the atmospheric dispersion modeling for the 2013 HHRA was the same as the data set used for the 2011 SLHHRA for the BGCAPP (i.e., the years 2004 through 2008). The use of meteorological data from this period—as opposed to the use of a more recent data set—was intended to provide compatibility between the findings of the 2011 SLHHRA and the 2013 HHRA. That is, the only credible way of evaluating the 2013

HHRA findings against those in the 2011 SLHHRA for the BGCAPP is to use the same set of meteorological input data for both studies.

- The receptor grid used in the atmospheric dispersion modeling was the same for the 2011 SLHHRA and for the 2013 HHRA.
- There were no differences in the two health risk assessments in regard to the approach undertaken to estimate the media concentrations of COPCs (e.g., in air, in soils for food uptake, transfer to livestock).
- There were no differences in the two assessments in regard to the quantification of exposure (i.e., direct exposure by inhalation, indirect exposure, and uptake by human receptors).
- In the characterization of risks and hazards, there were no differences in the approach taken in the two health risk assessments, except for the addition of new COPCs in the 2013 HHRA.

2013 HHRA Findings for the Proposed EDT Facility. The results of the atmospheric dispersion modeling show that the maximum off-site airborne concentration would be expected to occur at the fenceline along the north-central boundary of the BGAD, to the north of the proposed EDT facility.

Table 3-8 shows the *excess individual lifetime cancer risk* for each type of EDT unit and for each exposure scenario as obtained from the 2013 HHRA. Within each column of EDT-specific data, the largest numerical value is highlighted in bolded, italicized font. The adult farmer exposure scenario produced the largest numerical cancer risk values for each of the four types of EDT units (i.e., the SDC, the TDC, the DAVINCH, and the EDS) operating by themselves (that is, without consideration of the simultaneous operation of the BGCAPP). The individual COPCs that provided the greatest contribution to the total cancer risk value were: mustard agent and bis(2-ethylhexyl)-phthalate for the SDC; mustard agent and bis(2-ethylhexyl)-phthalate for the TDC; mustard agent for the DAVINCH; and mustard agent for the EDS.

Table 3-8 also shows the combined, cumulative cancer risks of each type of EDT unit and the BGCAPP operating simultaneously, and these risks are expressed as a simple arithmetic sum—even though the location of the hypothetical maximum exposed receptor may not be the same for the emissions from the BGCAPP as for the emissions from the proposed EDT facility. The adult farmer exposure scenario produced the largest numerical cancer risk values for each type of EDT unit operating in combination with the BGCAPP.

Table 3-8. Cumulative Carcinogenic Risk Values (BGCAPP plus each type of EDT Unit).

Receptor/Scenario	Technology								
	BGCAPP Alone ^a	SDC		TDC		DAVINCH		EDS	
		SDC Alone ^a	SDC plus BGCAPP ^a	TDC Alone ^a	TDC plus BGCAPP ^a	DAVINCH Alone ^a	DAVINCH plus BGCAPP ^a	EDS Alone ^a	EDS plus BGCAPP ^a
Adult resident	1.49E-07	4.65E-10	1.49E-07	2.42E-08	1.73E-07	2.01E-08	1.69E-07	5.00E-10	1.50E-07
Child of resident	4.07E-08	9.35E-11	4.08E-08	4.89E-09	4.56E-08	4.16E-09	4.49E-08	1.01E-10	4.08E-08
Adult fisher	1.49E-07	4.65E-10	1.49E-07	2.42E-08	1.73E-07	2.01E-08	1.69E-07	5.01E-10	1.50E-07
Child of fisher	4.08E-08	9.36E-11	4.09E-08	4.89E-09	4.57E-08	4.16E-09	4.50E-08	1.01E-10	4.09E-08
Adult farmer	1.79E-07	1.38E-09	1.81E-07	4.03E-08	2.20E-07	3.26E-08	2.13E-07	6.67E-10	1.80E-07
Child of farmer	4.67E-08	2.57E-10	4.70E-08	6.60E-09	5.33E-08	5.43E-09	5.21E-08	1.01E-10	4.68E-08
Percent of Acceptable Risk Value ^a			1.8%		2.2%		2.1%		1.8%
Percent of Combined Risk Attributed to EDT			0.8%		18.4%		15.4%		0.4%

Notes:

^a Acceptable risk = 1.0E-05; The largest numerical value for each EDT is shown in bolded, italicized font.

Sources: Franklin Engineering Group, Inc., *Screening-Level Human Health Risk Assessment Results for Blue Grass Agent-Destruction Pilot Plant (BGCAPP)*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., prepared for Bechtel Parsons Blue Grass, Richmond, Ky., May 2011; Franklin Engineering Group, Inc., *Human Health Risk Assessment Report for Explosive Destruction Technology (EDT) Alternatives at Blue Grass Chemical Agent-Destruction Pilot Plant*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., prepared for Bechtel Parsons Blue Grass, Richmond, Ky., December 2012; Franklin Engineering Group, Inc., *Addendum to Multipathway Human Health Risk Assessment Report for Explosive Destruction Technology (EDT) Alternatives at Blue Grass Chemical Agent-Destruction Pilot Plant [Revised EDS Modeling]*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., prepared for Bechtel Parsons Blue Grass, Richmond, Ky., March 2013.

The results in Table 3-8 show that the contribution of each type of EDT unit to the overall combined cancer risk is about 0.8 percent for the SDC, about 18 percent for the TDC, about 15 percent for the DAVINCH, and about 0.4 percent for the EDS.

The results in Table 3-8 also show that any of the four types of EDT units in combination with the BGCAPP would produce numerical values for the excess individual lifetime cancer risks that are within acceptable limits. The risk for the worst-case exposure scenario from the combined BGCAPP and EDT emissions for each of the four EDT systems is much lower than the acceptable risk level of 1×10^{-5} (i.e., the approximate risk levels for these combined emissions are 1.8×10^{-7} for the SDC, 2.2×10^{-7} for the TDC, 2.1×10^{-7} for the DAVINCH, and 1.8×10^{-7} for the EDS). The combined lifetime cancer risk from the BGCAPP emissions in combination with the risk from the emissions from any of the four types of EDT units is between about 45 and 55 times lower than the acceptable risk level of 1×10^{-5} .

Table 3-9 shows the *chronic non-carcinogenic risk*, expressed as an HI value, for each type of EDT unit and for each exposure scenario. Within each column of EDT-specific data, the largest numerical HI value is highlighted in bolded, italicized font. The exposure scenario for the child of the farmer produced the largest numerical HI values for each of the four types of EDT units operating by themselves (that is, without consideration of the simultaneous operation of the BGCAPP). The individual COPCs that provided the greatest contribution to the total non-cancer HI value were: mustard agent and bis(2-ethylhexyl)-phthalate for the SDC; mustard agent, bis(2-ethylhexyl)-phthalate, and mercuric chloride for the TDC; mustard agent for the DAVINCH; and mustard agent for the EDS.

Table 3-9 also shows the combined, cumulative non-cancer HI values for each type of EDT unit and the BGCAPP, and these HI values are expressed as a simple arithmetic sum—even though the location of the hypothetical maximum exposed receptor may not be the same for the emissions from the BGCAPP as for the emissions from the proposed EDT facility. The exposure scenario for the child of the farmer produced the largest numerical HI values for each type of EDT unit operating in combination with the BGCAPP. The results in Table 3-9 show that the contribution of each type of EDT unit to the overall combined non-cancer HI value is about 0.1 percent for the SDC, about 9 percent for the TDC, about 7 percent for the DAVINCH, and about 0.1 percent for the EDS. Furthermore, the results in Table 3-9 also show that any of the four EDT systems in combination with the BGCAPP would produce numerical values for the chronic non-cancer risks (expressed as HI values) that are within acceptable limits. That is, the HI value for the BGCAPP emissions in combination with the HI value for any of the four types of EDT units is between about 18 and 20 times lower than the acceptable level of 0.25.

Table 3-9. Cumulative Non-carcinogenic HI Values (BGCAPP plus each type of EDT Unit).

Receptor/Scenario	Technology								
	SDC			TDC		DAVINCH		EDS	
	BGCAPP Alone ^a	SDC Alone ^a	SDC plus BGCAPP ^a	TDC Alone ^a	TDC plus BGCAPP ^a	DAVINCH Alone ^a	DAVINCH plus BGCAPP ^a	EDS Alone ^a	EDS plus BGCAPP ^a
Adult resident	4.92E-03	1.13E-05	4.93E-03	1.20E-03	6.12E-03	6.81E-04	5.60E-03	1.39E-05	4.93E-03
Child of resident	9.95E-03	1.14E-05	9.96E-03	1.21E-03	1.12E-02	7.10E-04	1.07E-02	1.41E-05	9.96E-03
Adult fisher	4.96E-03	1.13E-05	4.97E-03	1.20E-03	6.16E-03	6.81E-04	5.64E-03	1.39E-05	4.97E-03
Child of fisher	9.98E-03	1.14E-05	9.99E-03	1.21E-03	1.12E-02	7.10E-04	1.07E-02	1.41E-05	9.99E-03
Adult farmer	6.20E-03	1.61E-05	6.22E-03	1.25E-03	7.45E-03	8.68E-04	7.07E-03	1.39E-05	6.21E-03
Child of farmer	1.24E-02	1.84E-05	1.24E-02	1.29E-03	1.37E-02	9.85E-04	1.34E-02	1.41E-05	1.24E-02
Percent of Acceptable Risk Value ^a			5.0%		5.5%		5.4%		5.0%
Percent of Combined Risk Attributed to EDT			0.1%		9.4%		7.4%		0.1%

Notes:

^a Acceptable risk = 0.25 = 2.5E-01; The largest numerical value for each EDT is shown in bolded, italicized font.

Sources: Franklin Engineering Group, Inc., *Screening-Level Human Health Risk Assessment Results for Blue Grass Agent-Destruction Pilot Plant (BGCAPP)*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., prepared for Bechtel Parsons Blue Grass, Richmond, Ky., May 2011; Franklin Engineering Group, Inc., *Human Health Risk Assessment Report for Explosive Destruction Technology (EDT) Alternatives at Blue Grass Chemical Agent-Destruction Pilot Plant*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., prepared for Bechtel Parsons Blue Grass, Richmond, Ky., December 2012; Franklin Engineering Group, Inc., *Addendum to Multipathway Human Health Risk Assessment Report for Explosive Destruction Technology (EDT) Alternatives at Blue Grass Chemical Agent-Destruction Pilot Plant [Revised EDS Modeling]*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., prepared for Bechtel Parsons Blue Grass, Richmond, Ky., March 2013.

Table 3-10 shows the *acute inhalation hazard*, expressed as an HI value, for each type of EDT unit. The individual COPCs that provided the greatest contribution to the acute HI value were: mustard agent for the SDC, elemental mercury for the TDC, hydrogen chloride for the DAVINCH, and methane for the EDS.

Table 3-10 also shows the combined HI for each type of EDT unit and the BGCAPP, and these HI values are expressed as a simple arithmetic sum—even though the location of the hypothetical maximum exposed receptor may not be the same for the emissions from the BGCAPP as for the emissions from the proposed EDT facility. The results in Table 3-10 show that the contribution of each type of EDT unit to the overall combined acute HI value is about 1.5 percent for the SDC, about 3 percent for the TDC, about 1 percent for the DAVINCH, and about 0.05 percent for the EDS. Furthermore, the results in Table 3-10 also show that any of the four EDT systems in combination with the BGCAPP would produce

Table 3-10. Combined Acute HI Values (BGCAPP plus each type of EDT unit).

Technology	EDT Technology Alone ^a	EDT plus BGCAPP ^a	EDT plus BGCAPP as Percent of Acceptable HI Value ^a	Percent of Combined EDT plus BGCAPP HI Attributable to the EDT
BGCAPP	2.56E-02	N/A	N/A	N/A
SDC	3.95E-04	2.60E-02	10.4 %	1.5 %
TDC	8.31E-04	2.64E-02	10.6 %	3.1 %
DAVINCH	2.46E-04	2.58E-02	10.3 %	1.0 %
EDS	1.24E-05	2.56E-02	10.2 %	0.05 %

Notes:

^a Acceptable risk = 0.25 = 2.5E-01

Sources: Franklin Engineering Group, Inc., *Screening-Level Human Health Risk Assessment Results for Blue Grass Agent-Destruction Pilot Plant (BGCAPP)*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., for Bechtel Parsons Blue Grass, Richmond, Ky., May 2011; Franklin Engineering Group, Inc., *Human Health Risk Assessment Report for Explosive Destruction Technology (EDT) Alternatives at Blue Grass Chemical Agent-Destruction Pilot Plant*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., prepared for Bechtel Parsons Blue Grass, Richmond, Ky., December 2012; Franklin Engineering Group, Inc., *Addendum to Multipathway Human Health Risk Assessment Report for Explosive Destruction Technology (EDT) Alternatives at Blue Grass Chemical Agent-Destruction Pilot Plant [Revised EDS Modeling]*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., prepared for Bechtel Parsons Blue Grass, Richmond, Ky., March 2013.

acute HI values that are within acceptable limits. That is, the acute HI value for the BGCAPP in combination with the acute HI value for each of the EDT alternatives is about 10 times lower than the acceptable level of 0.25.

In addition to the above three measures of risk (i.e., the excess individual lifetime cancer risk, the chronic non-carcinogenic risk, and the acute inhalation hazard), which were computed at the most impacted off-site location at the BGAD, a computation was also made for this EA in regard to the potential risks at the locations of farmlands nearest to the BGAD. Such farmlands and agricultural activities are located adjacent to the eastern BGAD boundary. The location of the nearby Eastern Kentucky University's Meadowbrook Farm, approximately 2.5 miles east of the proposed EDT site at the southwest corner of the BGCAPP footprint, was selected for evaluation. The analysis included a quantification of the air concentrations and deposition rates at the Farm as a percentage of their respective values at the location of maximum calculated off-site (i.e., fence line) impacts. The results of this analysis demonstrated that the worst-case emissions from any of the four types of EDT units would produce an air concentration at the Farm location that would be only about 30 percent of the concentration at the location of maximum impact as determined in the 2013 HHRA. Similarly, the deposition rate at the Farm location was found to be approximately 15 times less than the deposition rate at the location of maximum impact as determined in the 2013 HHRA. Hence, the human health risks would be correspondingly less at the locations of the nearby farmlands and agricultural activities than the risk values presented above for the location of maximum impact.

Discussion of Uncertainty in the 2013 HHRA. The 2013 HHRA (Franklin 2012, 2013) included a discussion on interpreting the uncertainty associated with the risk assessment. Even though the potential for introducing uncertainty is inherent in every step of the risk assessment methodology, conservatism is incorporated into many of the assumptions and numerical input values. While this reduces the likelihood of understating the risk or hazard, there is nevertheless a great potential for the risk and hazard to be overstated due to the incorporation of so many conservative elements. The screening-level procedure used for the 2013 HHRA generally includes a greater number of such conservative elements than a more-detailed, site-specific multi-pathway human health risk assessment.

The following list identifies the general sources of uncertainty that are discussed in the 2013 HHRA as possibly having an impact on the numerical baseline EDT risk and HI values presented in Tables 3-8, 3-9, and 3-10 in this EA.

- Uncertainty in the numerical values for the variables and parameters used in the risk calculations,

- Uncertainty in the models, including a wide variety of uncertainties associated with the inaccuracies of using surrogates for actual real-world data,
- Decision-rule uncertainty as related to the selection of COPCs and the use of recommended default values for inhalation, consumption, body mass, and health benchmarks, and
- Variability and uncertainty in using EPA-recommended health benchmarks and in the dioxin toxicity equivalency methodology.

Some aspects of the above uncertainty items can produce a quantifiable effect, while the effects of others can only be assessed qualitatively. The overall favorable findings of the 2013 HHRA for the proposed EDT facility indicate that no further handling of uncertainty is necessary; hence, no quantitative estimate of uncertainty in the risk and hazard values has been made.

Health Risk Conclusions. Based on the above findings, the results of the 2013 HHRA for the proposed EDT facility demonstrate that the emissions from any of the four EDT systems (i.e., either the one SDC, the two TDCs, the two DAVINCH units, or the seven EDS units) would satisfy the acceptable levels of risk as established by the KDEP. Furthermore, the combined risks of the proposed EDT facility and those of the BGCAPP—if they were to be in operation at the same time—would also fall beneath all of the risk thresholds that are acceptable to the KDEP. Both the predicted air concentration values and the predicted deposition rates indicate that any impacts to nearby farmlands or agricultural activities would not be significant.

3.1.3.2 Worker safety

Human health impacts could occur to workers during the construction of the proposed EDT facility, as well as during its operation. Such impacts are discussed in the following paragraphs.

Worker Health Impacts during Construction. The 2002 FEIS (PMCD 2002) categorized the existing BGAD chemical storage area as an area requiring environmental evaluation due to the suspected presence of chemical agents and chemical agent degradation products. The site for the proposed EDT facility is outside the existing storage area and is not adjacent to any other areas of known environmental problems. Therefore, no human health impacts would be expected from construction activities that involved any disturbance of potentially contaminated soils.

It is anticipated that exposure to common industrial solvents and other chemicals could occur during construction activities; however, no unusual construction materials are expected to be used. The potential for human health impacts during construction would thus be limited to occupational hazards. Routine and well-documented safety hazards would be present during the operation of construction vehicles and heavy machinery. The hazards of constructing and installing the EDT equipment would be similar to those of any small-scale industrial construction project and would not be significant or unique. The occupational health effects from construction activities would therefore be minor because standard procedures, construction practices, and protective clothing and equipment would be used by workers to minimize the potential for adverse impacts.

No significant human health impacts would be expected to occur during the construction of the proposed EDT facility.

Worker Health Impacts during Operations. The potential exists for workers to experience exposure to the emissions from the proposed EDT facility. Identifying specific inhalation exposures and risks for workers would depend in large part on detailed facility designs that are not yet available. However, the workplace environment would be monitored to ensure that airborne chemical concentrations were below applicable occupational exposure limits. Health risks from occupational exposure through all pathways would be minimized because the operation of the EDT unit(s) would be conducted inside an environmental protection structure with its own ventilation and filtration system (see Section 2.1.2).

No specific worker exposure scenarios were developed in the 2013 HHRA (Franklin 2012, 2013) for the proposed EDT facility; however, the contributions of the inhalation exposure pathway were separately calculated for both the *excess individual lifetime cancer risk* and the *chronic non-carcinogenic risk*. These measures of risk can be used as surrogates for an individual who works at the BGAD.

For the inhalation pathways, the exposure scenarios used in the 2013 HHRA included an assumption that the exposed individual (i.e., a surrogate being used for the worker in this analysis) was located at the BGAD for 24 hours per day, 350 days per year, for up to 30 years. Inhalation of the emissions from the proposed EDT facility (and/or from the BGCAPP) was assumed to occur during the operational period of the facility. As described in the 2013 HHRA report, the operational period for each of the four EDT systems was based on the throughput rate for the number of EDT units specified. The operational period varied from the shortest period of 28.4 weeks for the one SDC unit to 39.0 weeks for the multiple EDS units. Table 3-11 shows the numerical levels of the inhalation risk. The numerical risk values are well within the acceptable levels of risk for any of the four types of EDT units.

Table 3-11. Risk (Inhalation Only) to a Hypothetical BGAD Worker from Emissions Associated with the BGCAPP and the Proposed EDT Facility.

Measure of Risk	BGCAPP Alone	EDT Technology (alone)			
		SDC	TDC	DAVINCH	EDS
Excess individual lifetime cancer risk ^a	1.4E-07	4.6E-10	2.4E-08	2.0E-08	5.0E-10
Chronic non-carcinogenic HI ^b	8.4E-04	1.1E-05	1.2E-03	6.6E-04	1.4E-05

Notes:

^a Acceptable risk = 1.0E-05

^b Acceptable HI = 0.25 = 2.5E-01

Sources: Franklin Engineering Group, Inc., *Screening-Level Human Health Risk Assessment Results for Blue Grass Agent-Destruction Pilot Plant (BGCAPP)*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., for Bechtel Parsons Blue Grass, Richmond, Ky., May 2011; Franklin Engineering Group, Inc., *Human Health Risk Assessment Report for Explosive Destruction Technology (EDT) Alternatives at Blue Grass Chemical Agent-Destruction Pilot Plant*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., prepared for Bechtel Parsons Blue Grass, Richmond, Ky., December 2012; Franklin Engineering Group, Inc., *Addendum to Multipathway Human Health Risk Assessment Report for Explosive Destruction Technology (EDT) Alternatives at Blue Grass Chemical Agent-Destruction Pilot Plant [Revised EDS Modeling]*, prepared by Franklin Engineering Group, Inc., Franklin, Tenn., prepared for Bechtel Parsons Blue Grass, Richmond, Ky., March 2013.

The hazards of mustard agent have been well documented in previous NEPA reviews, including the 2002 FEIS (PMCD 2002), and the Army has developed and implemented engineering barriers (such as filtered ventilation systems and protective clothing), procedures, and administrative controls to deal appropriately with these hazards. Similar to operations at the BGCAPP, the operations at the proposed EDT facility could expose surrounding facilities to explosive and chemical agent hazards. It would also be expected that worker personnel could be exposed at some point to caustic solutions in response to decontamination and/or clean-up operations for leakage of chemical agent or for cleaning contaminated equipment and facilities.

Potential accidents and exposures that could occur at the proposed EDT facility are addressed and mitigated via hazard analysis and risk reduction as required by Army Regulation (AR) 385-10, *The Army Safety Program* (U.S. Army 2011). Concerns with respect to location, siting, and exposures to and from adjacent facilities (e.g., from the proposed EDT facility to the BGCAPP, and vice versa) would be addressed by AR 385-10 and via submittal of an Explosive Safety Site Plan for the EDT facility through Army chain of command to the Department of Defense Explosive Safety Board, which uses DOD 6055.9, *DOD Ammunition and Explosives Safety Standards* (DOD 2008), as its regulatory document

with respect to explosive and chemical munition operations and facility siting. The public access exclusion distances for the proposed EDT facility—including the intraline distance (ILD), the inhabited building distance (IBD), and the public transportation distance (PTD)—would be established through these processes.

On-site personnel working at either the BGCAPP or the proposed EDT facility would be trained in the appropriate safe handling procedures and responses to potential exposures associated with their activities prior to being allowed to work at their respective facility. All personnel on site during operations would have respiratory protection provided for escape purposes and would be required to carry that protection with them. In the event of a chemical agent incident, on-site personnel would either evacuate to a rendezvous point or shelter in place at designated safe locations.

Hearing protection would be provided to workers, as appropriate, when they are in close proximity to (1) the equipment used to load and unload the containment vessel for any of the four types of EDT units, (2) ventilation fans, blowers, and operating off-gas treatment systems, or (3) back-up generators, when in operation. Personnel would not be permitted to be at or near the EDT unit when detonation operations take place.

For the above reasons, no significant human health impacts would be expected to occur to on-site workers during the operation of the proposed EDT facility.

Worker Health Risks from Leaking Munitions. The igloos in which the chemical munitions are stored at the BGAD are routinely monitored for chemical agent leaks. Environmental permit conditions require storage igloo roof vents to be closed, and air monitoring through the igloo headwall is conducted, prior to worker entry into an igloo containing chemical agent. Carbon filtration units are used if leaking chemical agent munitions are identified by monitoring. These types of controls would be effective in preventing any significant release of chemical agent from the munitions either as a vapor or liquid when they leak. In addition, BGAD personnel also utilize entry procedures and monitoring to ensure unmasked workers are routinely protected to the approved worker exposure limit.²

3.1.3.3 Accidents

Potential safety hazards are associated with the movement of the mustard-filled munitions and DOT bottles from their current storage locations to the location of the

² The regulatory level of interest includes the chemical agent concentration and the inhalation dose associated with the worker population limit (WPL).

proposed EDT facility. In addition, hazards are also associated with the loading of the munitions and/or explosive components into the EDT unit. Generally, the greatest anticipated hazards associated with any of the four types of EDT units—as is also true when considering the BGCAPP operations—would revolve around the explosive and chemical agent hazards of the munitions themselves. While some of the EDT systems may include the use of donor charges, the hazard introduced by these charges is still explosive in nature and, technically, no new hazards are introduced because explosive handling protocols are still required and are unlikely to be different in nature from those to be employed at the BGCAPP. The potential risk of exposure to such a hazard (i.e., possible increase in severity or probability) would need to be evaluated for acceptability. Therefore, while it is not expected that any additional hazards would be introduced by the use of an EDT at the BGAD, the risks associated with those hazards would need to be evaluated.

Specific hazards that would be posed by any of the four EDT systems and their associated risks would be identified and evaluated after the final configuration of the proposed operations is complete. A hazards analysis would be conducted for all operations involving chemical agents or whenever there is a change in production, process, or control measures that could result in an increase in operational risk. A written record of the hazard analysis would be made and retained with the record copy of the standard operating procedure. The analysis must include description of the operation, locations identified within the operation, effects of hazards on the operation, risk assessment code, and recommended actions to reduce the hazards. The hazard analyses would consider previous incidents that had a likely potential for adverse consequences in the workplace.

Consequences of the failure of engineering and administrative controls would also be addressed. A written plan outlining employee participation in the development and implementation of the hazard analysis and in development of other process safety management elements would be required. Employees and their representatives would have access to the information so developed. Applicable portions of 29 CFR 1910.119 would be applied to ensure chemical hazards are manageable. All hazard analyses and operating procedures would be reviewed and concurred with by the installation safety manager.

Measures would be employed to reduce the potential for an accident during the construction and operation of the proposed EDT facility; however, such measures would not be significantly different from those expected to be in place for the BGCAPP. These measures would be in place to contain any contamination in the unlikely event that an accidental release involving mustard agent should occur, and to clean up contaminated facilities or equipment in the even more remote possibility that an accident should result in external contamination.

Measures to avoid a potential accident include: (1) design of the facility to include multiple monitoring and fail-safe features to automatically shut down operations should

abnormal conditions arise, (2) intensive training of personnel in monitoring and assessing facility conditions, and in using proper operational and contingency procedures, and (3) strict adherence to the health and safety requirements developed to support operations at the EDT facility. In the event that an accident were to occur during operations, the redundant containment features (for example, multiple containment barriers and negative air pressure ventilation systems) to be designed into the proposed EDT facility would reduce the likelihood that mustard agent could escape into the environment. If an accidental release of mustard agent were to occur, which involved a spill or downwind deposition of agent, the Army has procedures, equipment, and trained personnel in place for addressing the situation quickly to contain contamination and clean up affected areas.

The aforementioned measures would control and contain, within the facility, the foreseeable accident scenarios associated with demilitarization operations at the BGAD. Furthermore, the 2002 FEIS (PMCD 2002) previously evaluated the potential consequences and environmental impacts of an accidental release of mustard agent by examining a bounding-type, hypothetical worst-case accident. The particular accident that was evaluated was applicable to accidents that could occur during the continued storage of munitions at the BGAD, as well as during destruction processing at the BGCAPP.

Because the 2002 FEIS concluded that the probability of such an accident occurring and subsequently involving off-post release of mustard agent was low, and because the proposed EDT facility does not introduce any additional hazards that would exceed the ones whose consequences have already been examined in the 2002 FEIS, it is concluded that the incremental impacts attributable to the proposed EDT facility due to any accidental releases of mustard agent would not create any significant additional impacts.

3.1.4 Ecological Resources

As discussed in the introduction to Section 3.1, the proposed action would not be expected to result in impacts to any viable aquatic resources, including wetlands. The potential effects on terrestrial ecological resources—as well as to threatened and endangered species and/or to species of special concern—are discussed in this subsection, as are the potential ecological risks associated with the operation of the proposed EDT facility.

3.1.4.1 Existing terrestrial resources

The vegetation in Eastern Kentucky can be considered transitional in nature, ranging from grassland species to forest tree species representative of the Cumberland Mountains. The majority of the BGAD site is maintained as fescue-dominated pastures that are mowed

periodically, with interspersed shrubs and trees. Vegetation on the majority of the installation has been impacted by cattle grazing (PMCD 2002; ACWA 2002).

Forest encompasses roughly 2,900 acres of the BGAD site, of which approximately 75 percent has been impacted by cattle grazing and browsing by deer. The three main forest types on the BGAD site are upland, riparian and flatwood. In general, the locations of different forest types on BGAD are based on soil type, moisture and aspect. Upland locations that are well-drained contain bluegrass mesophytic cane forest, bluegrass savannah woodland, and forests characteristic of calcareous soils. Bottomlands along Muddy Creek, Viny Creek, tributaries of Little Muddy Creek, and the headwaters of Otter Creek support riparian forests. (See Section 3.1.2 for a discussion of surface water resources at the BGAD.) The flatwood forest (bottomland forest) is restricted to poorly drained soils on the northern portion of the BGAD site (PMCD 2002; ACWA 2002).

Two separate locations are being considered for the proposed EDT facility. One location is entirely within the footprint of the BGCAPP at its southwest corner (see Figure 2-9) and will accommodate the SDC, the TDC, or the DAVINCH systems, but not the EDS system. The alternative site that will accommodate the multiple EDS units is located just north of the BGCAPP site (see Figure 2-9).

Both the proposed site and the alternate site are already highly disturbed, and each of these sites contains very little vegetation. These sites contain very limited viable habitat for terrestrial wildlife.

Impacts to wildlife present at both the proposed site and the alternate site for the EDT facility would normally include potential for injuries or death from collision with construction vehicles and equipment during construction, and increased road traffic accessing the facility during the operational phase. Indirect impacts would normally include displacement from noise and equipment disturbance during construction, and routine noise, traffic, and human disturbance during operations. However, because of the very limited habitat in the proposed area of disturbance for both sites, such impacts would be minimal for the proposed action. Furthermore, these impacts were previously considered for the area of construction for both the proposed site and the alternate site, and the conclusion was reached that, because of the abundance of similar habitat next to cleared areas, no impacts on the continued survival of local populations of these species would be expected (PMCD 2002; ACWA 2002; USACE 2004; USACE 2011). Because the areas to be disturbed by construction at either of the two possible locations for the proposed EDT facility are within or immediately adjacent to the footprint area which has already undergone environmental review for the BGCAPP, the same conclusion would apply: construction of an EDT facility using any of the four EDT systems would have negligible impacts on terrestrial resources.

3.1.4.2 Threatened and endangered species

Both the 2004 EA that was prepared for the BGCAPP and its access road (USACE 2004) and its supplement (USACE 2011) fully addressed potential impacts to threatened and endangered species resulting from that project. Consultation with the U.S. Fish and Wildlife Service (FWS) conducted for that project identified seven Federally-listed endangered species that occur within 30 miles of the BGAD. Five Federally-listed threatened and three candidate species were also identified as being known to occur in the area (USACE 2004; USACE 2011).

Of the federally listed species, only the endangered running buffalo clover (*Trifolium stoloniferum*) is known to occur at BGAD. Running buffalo clover is most commonly found on rich soils in habitat types that provide filtered light, such as open woodlands, savannas, floodplains, and mesic stream terraces at well-drained sites. It was concluded in the EA for the BGCAPP footprint and its new access road (USACE 2004)—and also in the supplement to that EA (USACE 2011)—that no running buffalo clover populations would be impacted by the construction of the BGCAPP facility as long as best management practices are implemented to control stormwater runoff, soil erosion, and sediment transport. The closest populations of running buffalo clover are approximately 800 ft from the alternate site for the proposed EDT facility (USACE 2011). Because both the proposed site and the alternate site for the EDT facility would be located wholly within the boundaries of the areas previously evaluated for the BGCAPP project, the same conclusion can be reached for the proposed EDT facility.

Two federally endangered bats, the gray bat (*Myotis grisescens*) and Indiana bat (*Myotis sodalis*) could potentially occur at the BGAD. The gray bat has been recorded along the Kentucky River; however, this species has not been recorded at the BGAD. Potential gray bat foraging habitat does exist along the Muddy Creek corridor and at a number of lakes on the BGAD. However, neither the proposed site nor the alternate site for the proposed EDT facility contain foraging habitat for this species. There are no confirmed records for the Indiana bat for either the BGAD or Madison County. The BGAD does contain potential maternity and summer roosting, and foraging habitat for this species (USACE 2004; FWS 2011). Six trees (larger than 5 inches in diameter) were identified on the proposed site that may provide potential roosting habitat for the Indiana bat. As per FWS guidance and in agreement with the BGAD's existing Integrated Natural Resources Management Plan (Stout et al. 2010), any required removal of these trees would be limited to the winter months (October 15 to March 31) in order to avoid any potential impacts to roosting bats. There are no trees on the alternate EDT site.

The bald eagle (*Haliaeetus leucocephalus*) is listed as threatened by the Kentucky State Nature Preserves Commission (KSNPC 2012). This species probably frequents Lake

Vega and other water bodies at the BGAD as a migrant. There are no resident or nesting bald eagles on the BGAD (USACE 2004; USACE 2011). Neither the proposed site nor the alternate site for the proposed EDT facility provides foraging or nesting habitat for this species.

The Integrated Natural Resources Management Plan (Stout et al. 2010) provides a list of fauna with known occurrence records for the BGAD. This list includes a number of other species listed by the Kentucky State Nature Preserves Commission as threatened, endangered or special concern (Table 3-12). However, each of the two possible sites for the proposed EDT facility provides either no or extremely limited habitat for these additional species. Habitat viable for these species is found elsewhere on the BGAD.

Based on the limited habitat, the potential for impacts to federally- and State-listed threatened, endangered, and special concern species during the construction of the proposed EDT facility using any of the three EDT systems at the proposed site or using the multiple EDS units at the alternate site is considered to be negligible.

The potential impacts of noise on wildlife populations resulting from the construction of the BGCAPP were previously evaluated (ACWA 2002). The noise levels generated by construction equipment would be expected to range from 77 to 90 dB(A). Noise would diminish to background levels at the northern and northeast BGAD boundaries. The previous evaluation noted that small mammals can be adversely affected by maximum noise levels created by construction equipment and that some research has shown that there could be temporary nest abandonment by birds as the result of sudden sonic booms of 80 to 90 dB. Songbirds may also abandon habitat due to episodic or continuous noise levels. Larger mammals, such as white-tailed deer (*Odocoileus virginianus*), may avoid the area during construction due to the noise and presence of workers. According to the analyses that were previously conducted, no long-term effects on the hearing ability of wildlife would be expected due to noise generated by construction activities (ACWA 2002).

The potential impacts of noise on wildlife populations resulting from the operation of the BGCAPP were also previously evaluated (ACWA 2002). The maximum noise level adjacent to the BGCAPP facility was estimated at 72 dB(A), with a decrease to approximately 50 dB(A) at a distance of 1,000 ft. The anticipated noise levels of 55 to 60 dB(A) near the BGCAPP facility boundary were evaluated as only having minor impacts on birds and mammals, with abrupt noises potentially resulting in temporary nest abandonment by birds. The estimated noise levels for the BGCAPP facility area were evaluated as not likely to interfere with the auditory function of birds and mammals (ACWA 2002). For an evaluation of the noise levels associated with the operation of the proposed EDT facility—which were found to be similar to the estimated noise levels during

Table 3-12. State Listed Fauna Species With Occurrence Records for the Blue Grass Army Depot.

Species	Status ^a
Mammals	
Black Bear (<i>Ursus americanus</i>)	Special Concern
Evening Bat (<i>Nycticeius humeralis</i>)	Special Concern
Amphibians	
Northern Leopard Frog (<i>Lithobates pipiens</i>)	Special Concern
Birds	
Northern Shoveler (<i>Anas clypeata</i>)	Endangered
Blue-winged Teal (<i>Anas discors</i>)	Threatened
Hooded Merganser (<i>Lophodytes cucullatus</i>)	Threatened
Pied-billed Grebe (<i>Podilymbus podiceps</i>)	Endangered
Double-crested Cormorant (<i>Phalacrocorax auritus</i>)	Threatened
Great Egret (<i>Ardea alba</i>)	Threatened
Osprey (<i>Pandion haliaetus</i>)	Special Concern
Sharp-shinned Hawk (<i>Accipiter striatus</i>)	Special Concern
Northern Harrier (<i>Circus cyaneus</i>)	Threatened
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	Threatened
American Coot (<i>Fulica americana</i>)	Endangered
Common Moorhen (<i>Gallinula chloropus</i>)	Threatened
Spotted Sandpiper (<i>Actitis macularius</i>)	Endangered
Short-eared Owl (<i>Asio flammeus</i>)	Endangered
Least Flycatcher (<i>Empidonax minimus</i>)	Endangered
Bank Swallow (<i>Riparia riparia</i>)	Special Concern
Sedge Wren (<i>Cistothorus platensis</i>)	Special Concern
Blackburnian Warbler (<i>Setophaga fusca</i>)	Threatened
Henslow's Sparrow (<i>Ammodramus henslowii</i>)	Special Concern
Dark-eyed Junco (<i>Junco hyemalis</i>)	Special Concern
Vesper Sparrow (<i>Pooecetes gramineus</i>)	Endangered
Rose-breasted Grosbeak (<i>Pheucticus ludovicianus</i>)	Special Concern
Bobolink (<i>Dolichonyx oryzivorus</i>)	Special Concern

^aSource: Kentucky State Nature Preserves Commission) 2012. *Rare and Extirpated Biota and Natural Communities of Kentucky*, May 2012; Available at http://naturepreserves.ky.gov/pubs/publications/ksnpc_ets.pdf

the operation of the BGCAPP—see Section 3.1.7 in this EA. Therefore, it is anticipated that any noise impacts on wildlife resulting from the operation of the proposed EDT facility would only be minor.

There would be some unavoidable impacts on wildlife due to traffic associated with construction activities that could result in an increased number of roadkills for species such as eastern cottontail (*Sylvilagus floridanus*), eastern gray squirrel (*Sciurus carolinensis*), eastern fox squirrel (*Sciurus niger*), opossum (*Didelphis virginiana*) and eastern chipmunk (*Tamias striatus*) (ACWA 2002). Larger mammals, such as white-tailed deer, could also be impacted.

3.1.4.3 Ecological risk assessment

A screening-level ecological risk assessment (SLERA) was previously conducted to assess the risk from air emissions for each of four technologies that were being considered for pilot testing at the BGAD (ACWA 2002). Screening-level risk assessments are typically based on very conservative assumptions that are intended to be protective of environmental resources; use of such assumptions enables chemicals that pose negligible risk to be eliminated from further consideration, while chemicals that do pose potential significant threats can be examined further. The details of the overall approach for the previous SLERA are given elsewhere (Tsao 2001) and are summarized here. In the 2002 SLERA, the estimated soil concentrations from the deposition of airborne emissions during normal operations were compared with ecotoxicological benchmark values that were based on conservative ecological endpoints developed by the EPA (EPA 2001). For those chemicals for which EPA had not developed soil screening values, values developed by state agencies or other sources were used.

The risks to ecological receptors (soil invertebrates, plants, and wildlife) were considered to be negligible where the SLERA showed negligible effects on soils at the BGAD. The comparison of soil deposition and a chemical-specific benchmark value was expressed as a hazard quotient (HQ); that is, a numerical value generated by dividing the predicted soil concentration by the soil benchmark value. Soil concentrations resulting in a numerical HQ value less than or equal to 1.0 are considered to pose negligible risk to ecological receptors, while chemicals having soil concentrations with a numerical HQ value greater than 1.0 are considered contaminants of potential concern that might affect ecological receptors and should be further evaluated.

A total of 44 chemicals in the ACWA emission inventory were analyzed in the 2002 SLERA for the technology ultimately selected for pilot testing at the BGCAPP (i.e., chemical neutralization followed by SCWO). Assumptions and a detailed description of the analysis

are provided elsewhere (Tsao 2001). None of the chemicals evaluated in the 2002 SLERA exceeded the soil benchmark values and thus would not result in a numerical HQ value that exceeded 1.0. In fact, the concentrations of all chemicals emitted from the BGCAPP stacks were found to be quite low.

More recently, an SLHHRA was prepared in 2011 to evaluate the human health risks associated with air emissions from the operation of the BGCAPP (Franklin 2011); see Section 3.1.3. The results of the 2011 SLHHRA demonstrated that operations at BGCAPP for both non-carcinogenic and carcinogenic risk calculations would be approximately one-tenth or less of established and generally accepted and recommended (i.e., for areas on industrial activity) benchmarks. The air modeling and risk calculations clearly indicated that unacceptable non-carcinogenic or carcinogenic health effects would not be expected (Franklin 2011). Subsequently, an HHRA was prepared in 2013 for each of the four types of EDT units under consideration in this EA (Franklin 2012, 2013). The results from the 2013 HHRA for the four types of EDT units were added to those of the 2011 SLHHRA for the BGCAPP to describe cumulative risks of the proposed EDT facility in simultaneous operation with the BGCAPP. For each of the EDT systems, the combined risk values would be lower by at least one order of magnitude than the risk levels of concern to the KDEP. The risk estimated for the proposed EDT facility would add a maximum of about 20 percent to the risk discussed and analyzed for the BGCAPP in the 2011 SLHHRA.

Although no SLERA has been conducted to assess the ecological risk from the emissions that would be generated by the proposed EDT facility, risk to organisms including the surrounding wildlife would be due to the same emitted contaminants as have already been analyzed in the 2013 HHRA. An addition of up to 20 percent to ecological risk would be of little practical consequence. The ecological risk assessment that was conducted for the 2002 ACWA EIS found that the COPCs with the highest soil-concentration HQ values were benzene and toluene; however, the HQ values for either of these COPCs were a factor of about 20 times lower than the ecological benchmarks of concern. Therefore, air concentrations and deposition of emission constituents from an EDT facility that used any of the four types of EDT units—even when added to those of the BGCAPP—would pose negligible ecological risk to terrestrial biota. Consequently, routine operations of an EDT facility with any of the four types of EDT systems would result in negligible impacts on terrestrial habitat and vegetation.

3.1.4.4 Conclusions about impacts to ecological resources

As explained in the introduction to Section 3.1 and reiterated in Sections 3.1.4.1 through 3.1.4.3, impacts to viable terrestrial resources (including vegetation and wildlife),

to aquatic resources, or to wetlands from the implementation of the proposed action would be minimal.

Impacts of construction on wildlife within the BGCAPP area, and associated access road, parking areas and utilities were addressed in a previous EA (USACE 2004). The construction of the BGCAPP (including support buildings) with the associated access road and parking areas was found to potentially impact upland forest and grassland communities (including a small area of Little Bluestem native grass). However, this habitat is relatively common throughout the BGAD. Therefore, impacts to terrestrial resources resulting from the BGCAPP would be minimal (USACE 2004).

The BGCAPP impacts approximately 119 acres, as compared to up to 10 acres for the proposed EDT facility. Furthermore, the site for the proposed EDT facility (as shown in Figure 2-9) is wholly contained within an already disturbed area of the BGCAPP project footprint and would thus impact very little natural terrestrial habitat. The alternate site for the proposed EDT facility (i.e., if the multiple EDS units were to be used), which lies immediately to the north of the BGCAPP footprint (see Figure 2-9), is also previously disturbed, and its use would impact very little natural terrestrial habitat. Therefore, impacts to terrestrial resources resulting from construction of the proposed EDT facility would be minimal.

The potential for impacts to federally- and State-listed threatened, endangered, and special concern species during the construction of the proposed EDT facility using any of the three EDT systems at the proposed site or using the multiple EDS units at the alternate site is also considered to be negligible, primarily due to the absence of such species or viable habitat in the proposed construction area. Any required removal of potential Indiana bat roost trees present on the proposed site would be limited to the winter months (October 15 to March 31) in order to avoid any potential impacts to roosting bats.

A SLERA was previously conducted to assess the risk from air emissions for each of four ACWA technologies that were being considered for pilot testing at the BGAD, including the chosen chemical neutralization/SCWO technology (ACWA 2002). More recently, a SLHHRA was prepared in 2011 to evaluate the human health risks associated with air emissions from the operation of the BGCAPP, and an HHRA was prepared in 2013 specifically for the proposed EDT facility. The cumulative risks of the proposed EDT facility using any of the four EDT systems were found to be lower by at least one order of magnitude than the risk levels of concern to the KDEP. The proposed EDT facility by itself would contribute up to about 20 percent of the overall levels of risk that were discussed and analyzed in detail in the 2011 SLHHRA for the BGCAPP.

Although no SLERA has been conducted for the proposed EDT facility, the addition of up to 20 percent to the ecological risk assessed in the 2002 SLERA would be of little practical consequence. It is concluded that routine emissions from the proposed EDT facility

over its operational lifetime—using any of the four EDT systems under consideration in this EA—would create negligible impacts on terrestrial or aquatic resources.

3.1.5 Socioeconomic Resources

For socioeconomic resources, the affected environment is Madison County because most of the BGAD's existing workforce resides in the county and because it is likely that most of the workers in-migrating for the construction or operation of the proposed EDT facility would also reside there. Thus, to provide an upper bound on the potential direct and indirect impacts of EDT-related employment and population growth, this analysis assumes that the impacts would be concentrated in Madison County. In addition, the HHRA conducted for the EDT facility (see Section 3.1.3.1) indicates that any health effects or impacts to farmland would be limited to Madison County.

Typically, the largest socioeconomic impacts of constructing and operating an industrial facility such as the proposed EDT facility result from population growth associated with the in-migration of workers. As workers in-migrate to a project area for employment during facility construction or operations, they and their families increase the demand for housing and public services, including water and wastewater treatment, solid waste disposal, schools, transportation, and other services. Conversely, the workers and their families also earn direct incomes and make purchases that benefit the local economy by creating indirect jobs and incomes and contributing to local tax revenues. Thus, the in-migration of workers can have both adverse and beneficial socioeconomic impacts. The following subsections discuss the potential socioeconomic impacts of the construction and operation of the proposed EDT facility.

3.1.5.1 Employment

As discussed in Section 2.1.3, EDT facility construction would require a relatively small workforce (up to 50 workers), but the workers would be on site for a relatively long time (approximately 27 months). Although these construction jobs would help the local economy by reducing unemployment, producing direct incomes, contributing to indirect jobs and incomes, and increasing purchases and tax revenues, the overall beneficial impact is likely to be very minor and temporary in the context of the regional economy.

Operation of the proposed EDT facility would require a larger workforce than construction (up to 210 operations workers for seven EDS units), but the operations workers would be on site for a shorter period (weeks; see Section 2.1.1). Because the operational period of the proposed EDT facility would be so brief, it is expected that any operations

workers who would relocate from outside the project region would do so only to continue employment at the BGCAPP facility after EDT operations are completed. The short-term EDT operations jobs would help the local economy by producing direct incomes, contributing to indirect jobs and incomes, and increasing purchases and tax revenues, but the overall beneficial impact is likely to be very minor and temporary in the context of the regional economy. The long-term economic impacts of these operations jobs have previously been addressed as part of the analyses in the 2002 FEIS (PMCD 2002), because the EDT operations workers would become part of the BGCAPP operations workforce that is discussed in that document.

3.1.5.2 Population

For construction of the proposed EDT facility, it is likely that any population growth would be very small because the construction workforce would be small (up to 50 workers) and would come primarily from within the project region. Thus, there would likely be few, if any, construction workers who would in-migrate with their families.

For operation of the proposed EDT facility, worker-related population growth could be larger than for construction because the operations workforce (up to 210 workers) would be larger than the construction workforce. However, the operations period (38 weeks) would be much shorter than the construction period (27 months). Thus, it is expected that any operations workers who would relocate from outside the project region would do so only to continue employment at the BGCAPP facility after EDT operations are completed.

To provide an upper bound on the potential direct and indirect impacts of EDT-related population growth, the analysis in this EA assumes that all 210 operations workers would in-migrate to Madison County with their families. This assumption is not overly conservative because it is expected the EDT operations workers would transition to the BGCAPP facility once EDT operations are completed. Assuming that each of the 210 in-migrating workers brings a spouse and one child [the average household size in Kentucky is 2.48 persons (USCB 2011a)], Madison County's population would increase by 630 persons. Such an increase would represent only about 0.7 percent of Madison County's total population (84,188 persons) (USCB 2011a). The long-term effects of these operations jobs in terms of population growth have previously been addressed as part of the analyses in the 2002 FEIS (PMCD 2002), because the EDT operations workers would become part of the BGCAPP operations workforce that is discussed in that document.

3.1.5.3 Housing

The construction and operation of the proposed EDT facility would not create significant population growth in Madison County and, therefore, would not generate significant additional demand for housing. Madison County's 2010 *Comprehensive Plan* projects that the unincorporated portions of Madison County could accommodate up to 6,500 new housing units by 2025. The plan concludes that there is adequate land in the unincorporated portions of the county to accommodate such residential development (Madison County 2010).

It is likely that the number of EDT facility construction and operations workers immigrating to the area would be so small as to create only a very minor increase in housing demand. The upper bound population growth discussed in Section 3.1.5.2 could add 210 new households to Madison County, which would represent only 5.0 percent of Madison County's existing 4,174 vacant housing units (USCB 2011b), and an even smaller percentage of the new housing units that could be built in Madison County by 2025. Thus, construction and operation of the proposed EDT facility are not likely to have a significant impact on the availability or cost of housing in Madison County. The long-term effects of operations-related population growth on housing have previously been addressed as part of the analyses in the 2002 FEIS (PMCD 2002), because the EDT operations workers would become part of the BGCAPP operations workforce that is discussed in that document.

3.1.5.4 Public services

The construction and operation of the proposed EDT facility would not create significant population growth or demand for housing in Madison County and, therefore, would not generate significant additional demand for public services. The long-term effects of operations-related population growth on public services have previously been addressed as part of the analyses in the 2002 FEIS (PMCD 2002), because the EDT operations workers would become part of the BGCAPP operations workforce that is discussed in that document.

Water and Wastewater. Most Madison County residents get their water from a public water supply. The City of Richmond operates a large water treatment plant on the Kentucky River and provides water for Richmond Utilities, Madison County Utilities, and the Kirksville Water District. Each of these water providers has excess capacity: Richmond Utilities has 5.1 million gal/day excess capacity, Madison County Utilities has 240,000 gal/day excess capacity, and Kirksville Water District has 152,000 gal/day excess capacity (Madison County 2010). Water in the southern portion of Madison County is provided by the City of Berea and the Southern Madison Water District. The City of Berea

has excess capacity of 1.4 million gal/day, but the Southern Madison Water District (which gets water from the City of Berea) operates at about 223,000 gal/day over capacity (Madison County 2010). Because the county's largest water suppliers (the cities of Richmond and Berea) have excess capacity, the small population increase that could occur with EDT facility construction and operation is not likely to have a significant impact on the availability of water in Madison County.

Madison County residents rely on either a public wastewater treatment system or a private on-site septic system for their wastewater disposal. The Cities of Richmond and Berea each provide public wastewater treatment and have excess capacity: Richmond Utilities has 16 million gal/day excess capacity and the Berea Sewer Commission has 1.7 million gal/day excess capacity (Madison County 2010). In northern Madison County, the North Madison County Sanitation District provides public wastewater treatment, and has excess capacity of 0.8 million gal/day. Residents in the unincorporated areas in the rest of Madison County rely on private on-site septic systems (Madison County 2010). The small population increase that could occur with EDT facility construction and operation is not likely to have a significant impact on the ability of Richmond Utilities, the Berea Sewer Commission, or the North Madison County Sanitation District City to provide wastewater treatment.

Solid Waste Disposal. In Madison County, various solid waste disposal services are provided by both public (Madison County, Richmond, and Berea) and private providers. Whether public or private, these providers pay a fee to use private landfill facilities in other counties because no landfill facilities are currently available in Madison County. Over 68,500 tons of solid waste from Madison County are disposed of in the Blue Ridge Recycling and Disposal Facility in Irvine, Kentucky (Estill County), the Rumpke Facility in Jeffersonville, Kentucky (Montgomery County), and the Tri-K Landfill in Stanford, Kentucky (Lincoln County) (Madison County 2010).

The small population increase that could occur with the construction and operation of the proposed EDT facility is not likely to have a significant impact on solid waste disposal in Madison County or the other Kentucky counties. In 2010, per capita solid waste generation in the United States was about 4.43 lb/day (or about 1,617 lb/yr) (EPA 2010). Assuming an upper bound of 630 new residents in Madison County associated with EDT operations, there would be about 509 tons of additional solid waste generated per year. This additional solid waste would represent a very minor increase (about 0.7 percent) in the existing solid waste generated in Madison County each year.

Schools. Public education in Madison County is provided by the Madison County School District, which operates ten elementary schools, five middle schools, and two high

schools with a total enrollment of over 10,000 students. All but one of Madison County's elementary schools is operating below capacity in terms of enrollment, but three of the four middle schools and both of the high schools are well above capacity. The Madison County School District has plans for school improvements and expansions in the next few years, but the county's projected population growth could require additional expansions, especially in Richmond and Berea (City of Richmond 2011; Madison County School District 2012).

It is likely that the number of EDT facility construction workers in-migrating to the area with school-age children would be so small as to create almost no increase in school enrollments. However, assuming an upper bound of 630 new residents associated with EDT operations, and an average household size of 3.0, there could be 210 new school-age children in Madison County. Such an increase would represent only about 2.1 percent of existing enrollment in Madison County, and the new students would be distributed among grades K through 12 and the various schools. Thus, although population growth associated with EDT facility construction and operation could add to the existing shortage of educational facilities, it is not likely to be large enough to create a significant impact on educational services in Madison County. In addressing population growth not related to EDT facility construction, the City of Richmond's 2011 *Comprehensive Plan* states that:

"In general, there will be sufficient capacity in the school system to accommodate the anticipated growth if development is coordinated with the school system as growth occurs. The school system currently owns sites that could be developed to meet long-term capacity needs and also has the ability to redistrict to meet short-term demands" (City of Richmond 2011).

Transportation. The main entrance to the BGAD is located on the facility's southwestern boundary on U.S. Highway 421 (Battlefield Memorial Highway). However, vehicular access to the proposed EDT facility would be via the BGCAPP facility access road, which intersects Kentucky State Route 52 (KY 52 or Irvine Road) near the BGAD's northern boundary (see Figure 2-9). The access road runs southward from KY 52 to the BGCAPP facility, with four lanes from KY 52 to the Access Control Building and then two lanes south to the BGCAPP facility (USACE 2004).

Route KY 52 from the city of Richmond to the BGCAPP access road is a five-lane highway, but it becomes a two-lane highway just east of the BGCAPP access road. Route KY 52 has an Annual Average Daily Traffic (AADT) count (bi-directional) of over 17,000 vehicles west of the BGCAPP access road, and an AADT count of over 13,600 vehicles east of the BGCAPP access road (KYTC 2012). On a highway with the capacity of KY 52, this volume of traffic represents a Level of Service (LOS) of "E", which

indicates that the highway is at capacity (Madison County 2010). According to Madison County's 2010 *Comprehensive Plan*:

“Regularly occurring traffic congestion in Madison County is confined mostly to the traditional A.M. and P.M. peak congestion periods . . . In the county, Irvine Road (KY 52) experiences peak hour congestion from the Richmond Bypass to the Estill County line” (Madison County 2010).

Partly as a result of this traffic congestion on KY 52, the intersections of KY 52 with KY 876 and with U.S. Highway 25 (two of the intersections through which drivers pass when driving east from Richmond to BGAD) had the second (124 accidents) and third (107 accidents) highest number of accidents, respectively, of any intersections in Madison County from 2005 to 2008 (Madison County 2010).

The EDT facility construction and operations workers would increase traffic on KY 52 and the BGCAPP access road as they drive to and from the site each day. There could be as many as 50 construction workers on site for up to 27 months. To bound the potential traffic impacts from these construction workers, the analysis in this EA assumes that there would be no carpooling and that all 50 construction workers would enter the BGCAPP access road at the same time each morning and would also exit the BGCAPP access road at the same time each afternoon. Thus, the construction workers could generate an additional 50 one-way trips each morning and afternoon, for a total of 100 additional round trips each day on KY 52 and the BGCAPP access road. It is not likely that this increase in traffic would have significant impacts in terms of congestion or safety on the BGCAPP access road, particularly since it was designed to accommodate the larger BGCAPP construction and operations workforces. However, 100 additional trips per day would have a minor impact on KY 52 by contributing to the existing traffic congestion and safety issues on the highway, especially if the trips occurred during the morning and afternoon traffic peaks. To reduce this impact on KY 52, BGAD could stagger shift changes for the EDT facility construction workers or require that they carpool to the site.

As discussed in Section 2.1.3, EDT facility operations could require a total of up to 210 workers, but not all of the operations workers would be on site at the same time. The EDT facility would operate 24 hours per day, and this assessment assumes that workers would be present in two 12-hr shifts each day. To bound the potential traffic impacts from these operations workers, this assessment assumes that there would be no carpooling and that half the workforce (105 workers) would enter and half the workforce (105 workers) would exit the BGCAPP access road at each shift change. Thus, the operations workers could generate an additional 210 one-way trips at each shift change, for a total of 420 additional round trips each day on KY 52 and the BGCAPP access road. Although this

increase in traffic would be larger than that experienced during EDT construction, it is not likely that it would have significant impacts in terms of congestion or safety on the BGCAPP access road, particularly since it was designed to accommodate the larger BGCAPP construction and operations workforces. However, 420 additional trips per day would have a minor impact on KY 52 by contributing to the existing traffic congestion and safety issues on the highway, especially because the additional trips would likely occur during the morning and afternoon traffic peaks. To reduce this impact to KY 52, BGAD could stagger shift changes for the EDT facility operations workers or require that they carpool to the site.

In addition to the worker vehicles, operation of the proposed EDT facility would generate between four and five additional truck shipments of waste each week (see Section 3.1.8.4). Such a small number of additional truck shipments would not have a significant impact on traffic flow or safety on KY 52 or the BGCAPP access road.

3.1.5.5 Agriculture

A separate socioeconomic topic that requires assessment is the potential for the proposed EDT facility to adversely affect agriculture in Madison County. Agricultural production, including both crops and livestock, remains vital to Madison County's economy. The most recent data on agriculture are from the U.S. Department of Agriculture's *2007 Census of Agriculture* as updated in December 2009 (the *2012 Census of Agriculture* will be published in 2014). Although the number of farms in Madison County decreased from 1,396 in 2002 to 1,328 in 2007, the total acreage devoted to agriculture only decreased from 218,304 acres to 218,194 acres (a decrease of about 0.05 percent). At the same time, the market value of all agricultural products sold from Madison County farms increased from \$35.6 million in 2002 to \$42.5 million in 2007, a 19.0 percent increase. It is apparent, however, that agricultural production in Madison County is shifting away from crops (especially tobacco) toward livestock. For example, the market value of all crops sold from Madison County farms decreased from \$12.1 million in 2002 to \$7.7 million in 2007 (a 36.4 percent decrease), while the market value of all livestock sold from Madison County farms increased from \$23.5 million to \$34.8 million (a 48.1 percent increase) (USDA 2002; USDA 2007).

The key issue related to agriculture in Madison County for EDT operations is the potential effect of chemical weapons destruction byproducts on livestock or crops in both the short term (emissions during facility operations) and the long term (soil deposition from those emissions). As discussed in Section 3.1.1.3, the air quality analysis that was conducted on the emissions from the proposed EDT facility examined the concentration of those emissions at the locations of farmlands near the BGAD. The results of this analysis demonstrated that the worst-case emissions from any of the four types of EDT units would

produce an airborne concentration at the location of the nearest potentially impacted farmlands that would be only about 30 percent of the concentration at the location of maximum impact as identified in the atmospheric dispersion calculations. Similarly, the deposition rate at the location of the nearest potentially impacted farmlands was found to be approximately 15 times less than the deposition rate at the location of maximum impact. The HHRA that was conducted on the emissions anticipated from proposed EDT facility found that there would be no significant human health impacts at the maximally impacted location (see Section 3.1.3.1). Thus, both the predicted air concentration value and the predicted deposition rate indicate that any impacts to nearby farmlands would likewise not be significant. As a result, it is not likely that EDT operations would have an adverse impact on agriculture in Madison County.

3.1.5.6 Cumulative impacts to socioeconomic resources

Construction and operation of the proposed EDT facility would contribute to the cumulative socioeconomic impacts of other actions in Madison County. The action most likely to combine with the EDT facility to create cumulative impacts is the construction and operation of the BGCAPP facility at the BGAD (see Section 1.1.2).

The 2002 FEIS (PMCD 2002) assesses the contribution to cumulative impacts of four alternative technologies for destroying the BGAD chemical agent stockpile, including the option of chemical neutralization processes followed by supercritical water oxidation (SCWO) that was selected for pilot testing at the BGCAPP. The 2002 FEIS concludes that none of the four alternatives, alone or in combination with other actions, would have any significant socioeconomic impacts in Madison County. The 2002 FEIS does identify potential cumulative impacts to traffic flow and safety on local roads (including impacts associated with road construction on KY 52) during construction and operation of the BGCAPP. However, the KY 52 road construction discussed in the 2002 FEIS has been completed, and the improvements would help reduce the traffic impacts discussed in the 2002 FEIS.

Because the BGCAPP and EDT construction and operations schedules could possibly overlap, there might be cumulative impacts to traffic flow and safety on KY 52 due to the large volume of additional traffic. However, the existing AADT traffic counts on KY 52 include current BGCAPP construction traffic, which will have peaked before EDT construction begins. Similarly, EDT operations traffic would likely peak before BGCAPP operations traffic peaks. Regardless, to bound potential impacts, this assessment assumes that the combined additional traffic generated during BGCAPP and EDT construction could add over 2,360 vehicle trips each day on KY 52 (assuming peak BGCAPP construction traffic) (Krejsa 2012). The combined additional traffic generated during BGCAPP and EDT

operations could add over 2,000 vehicle trips each day on KY 52 (assuming peak BGCAPP operations traffic) (Krejsa 2012). Although the existing AADT traffic counts on KY 52 reflect these potential increases somewhat because they include current BGCAPP construction traffic, such large increases would continue to have a moderate cumulative impact on KY 52 by contributing to the existing traffic congestion and safety issues on the highway, especially during the morning and afternoon traffic peaks. As discussed in Section 3.1.5.4, BGAD could reduce this cumulative impact to KY 52 by staggering shift changes for the construction and operations workers or require that they carpool to the site.

In addition to the worker vehicles, operation of the BGCAPP and the EDT facility would generate between four and five additional truck shipments of waste per day under the worst case scenario (see Section 3.1.8.4). Such a small number of additional truck shipments would not have a significant cumulative impact on traffic flow or safety on KY 52 or the BGCAPP access road.

3.1.6 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs each federal agency to identify and address the “disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.” The Council on Environmental Quality (CEQ) guidance on environmental justice defines “minority” as:

Individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (CEQ 1997).

The CEQ guidance states that a “minority population” should be identified where either:

(a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis (CEQ 1997).

The CEQ guidance states that a “low-income population” should be identified using statistical poverty thresholds from the Census Bureau’s Current Population Reports, Series P-60 on Income and Poverty (CEQ 1997).

This analysis uses data from the 2010 Census (USCB 2010a) and the *2006-2010 American Community Survey 5-Year Estimates* (USCB 2010b) to identify minority or low-income populations that could suffer disproportionately high and adverse human health or environmental effects from the proposed action at the BGAD. The first step in the analysis is to determine whether there are any minority or low-income populations in the potentially affected area. If any such populations are identified, the second step is to determine whether they would suffer any disproportionately high and adverse human health or environmental effects.

3.1.6.1 Minority and low-income populations

The BGAD is located within census tract³ (CT) 110 in Madison County (Figure 3-4). However, this analysis also includes CTs 101.01, 102, 103, 104, 105, 106, 109.01, 109.02, 109.03, and 111 in Madison County (Figure 3-4) because the boundaries of these CTs encompass the geographical distribution of the potential human health and environmental effects identified in the human health risk assessment conducted on the proposed EDT facility (see Section 3.1.3.1) as well as the potential environmental impacts discussed in Sections 3.1.1 through 3.1.5 of this EA.

As indicated by the data in Table 3-13, the percentage of the total population that identifies itself as minority in Madison County (9.6 percent) is lower than that of the state of Kentucky (13.7 percent) and the United States (36.3 percent). Within Madison County, CT 103 (18.9 percent) and CT 104 (22.5 percent), which are both in the city of Richmond, have minority percentages that are “meaningfully greater” than Madison County’s (9.6 percent) and much larger than Kentucky’s (13.7 percent). Therefore, for this analysis, the populations in CT 103 and CT 104 are considered minority populations as defined by the CEQ guidance (CEQ 1997).

The percentage of low-income individuals (i.e., with income below the poverty level) in Madison County (18.9 percent) is slightly higher than that of the state of Kentucky (17.7 percent) and the United States (13.8 percent) (see Table 3-13). Within Madison County, CT 102 (36.9 percent), CT 103 (26.0 percent), CT 104 (31.2 percent), CT 105 (69.4 percent⁴), CT 109.02 (27.2 percent), and CT 109.03 (37.2 percent), all of which are at

³ The U.S. Census Bureau defines census tracts as small, relatively permanent statistical subdivisions of a county or equivalent entity that are updated by local participants prior to each decennial census. The primary purpose of census tracts is to provide a stable set of geographic units for the presentation of statistical data. Census tracts generally have a population size between 1,200 and 8,000 people, with an optimum size of 4,000 people (USCB 2012a).

⁴ The low-income percentage for Census Tract 105 is abnormally high because almost all of the Census Tract residents are students at Eastern Kentucky University.

least partially within the city of Richmond, have much higher low-income percentages than those of Madison County (18.9 percent), Kentucky (17.7 percent), and the United States (13.8 percent). Therefore, for this analysis, the populations in CT 102, CT 103, CT 104, CT 105, CT 109.02, and CT 109.03 are considered low-income populations as defined by the CEQ guidance (CEQ 1997).

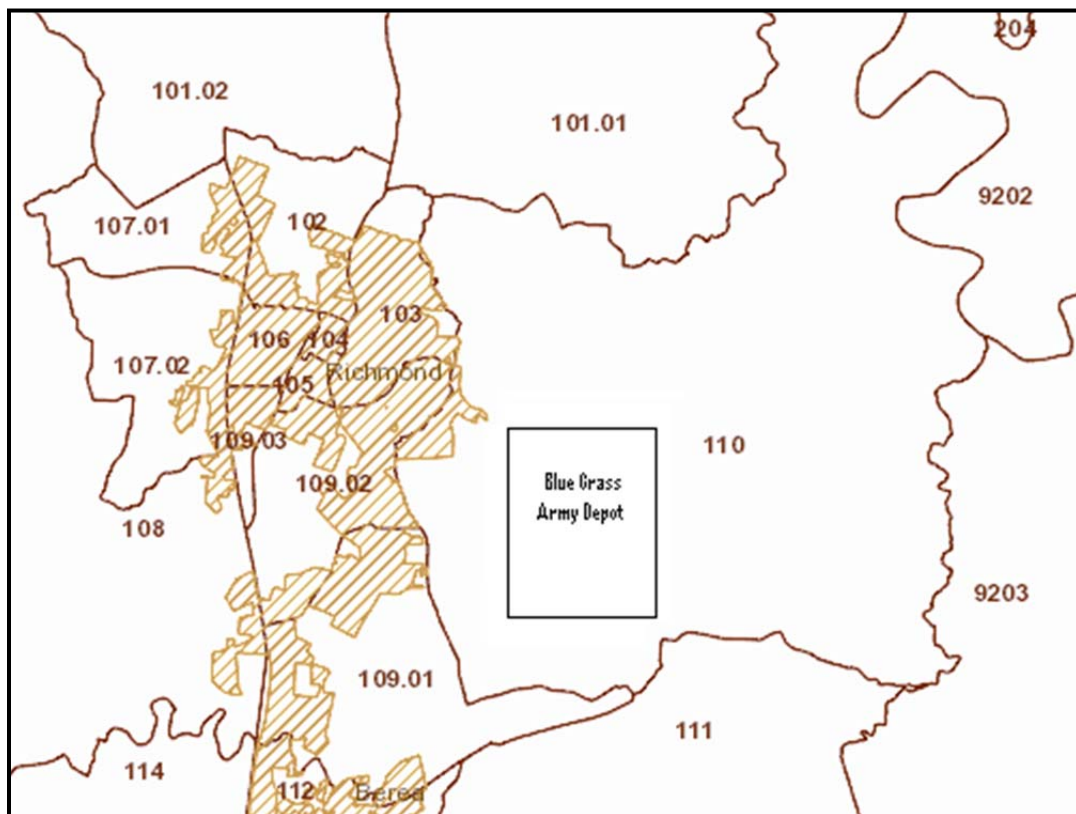


Figure 3-4. Census Tracts Surrounding the BGAD
(Source: Modified from U.S. Census Bureau, *American FactFinder*, Washington, D.C., 2012b)

Table 3-13. Minority and Low-Income Data for the United States, the State of Kentucky, Madison County, and the Census Tracts Surrounding the BGAD.

Location	Percent minority^a (2010)	Percent low-income^b (2010)
United States	36.3	13.8
Kentucky	13.7	17.7
Madison County	9.6	18.9
CT 101.1	4.2	4.9
CT 102	12.9	36.9 ^c
CT 103	18.9 ^c	26.0 ^c
CT 104	22.5 ^c	31.2 ^c
CT 105	12.9	69.4 ^{c,d}
CT 106	9.5	15.6
CT 109.01	6.3	9.4
CT 109.02	10.6	27.2 ^c
CT 109.03	13.3	37.2 ^c
CT 110 (includes the BGAD)	4.9	14.4
CT 111	3.7	11.5

Notes:

^a Includes all persons who identified themselves as non-white or as “Hispanic or Latino” regardless of race.

^b Represents individuals below the poverty level as defined by the Census Bureau.

^c Represents “Environmental justice population” based on percent minority or low-income.

^d The low-income percentage for Census Tract 105 is abnormally high because almost all of the Census Tract residents are students at Eastern Kentucky University.

Sources: U.S. Census Bureau, *American FactFinder*, “2010 Demographic Profile Data, Table DP-1,” and “2006-2010 American Community Survey 5-Year Estimates, Table DP03,” Washington, D.C., 2010.

3.1.6.2 Human health and environmental effects

Because this analysis considers CT 102, CT 103, CT 104, CT 105, CT 109.02, and CT 109.03 minority and/or low-income populations under CEQ guidance, the next step is to determine whether those populations would suffer any “disproportionately high and adverse human health or environmental effects” from the proposed action or alternative actions at the BGAD.

In terms of human health effects, the 2013 HHRA for the proposed EDT facility (see Section 3.1.3.1) identified no significant health effects for any population from the emissions of the proposed EDT facility over its operational lifetime. Further, the health risk assessment uses a pair of scenarios (namely, the farmer and the fisher) that may be representative of the subsistence lifestyles of some minority or low-income populations around the BGAD. The 2013 HHRA found no health risk concerns for such individuals. Therefore, the minority and low-income populations identified near the BGAD would not suffer any disproportionately high and adverse human health effects from the proposed action or alternative actions at the BGAD.

Similarly, the analyses in Sections 3.1.1 through 3.1.5 conclude that there would be no significant impacts to environmental resources—including air quality, water, ecological resources, and socioeconomic resources—from constructing or operating the proposed EDT facility. Therefore, the minority and low-income populations identified near the BGAD would not suffer any disproportionately high and adverse environmental effects from the proposed action.

3.1.6.3 Cumulative impacts

Construction and operation of the proposed EDT facility would contribute to the cumulative impacts of other actions in Madison County. The action most likely to combine with the proposed EDT facility to create cumulative impacts is the construction and operation of the BGCAPP facility at the BGAD (see Section 1.1.2).

The 2002 FEIS (PMCD 2002) assesses the contribution to cumulative impacts of four alternative technologies for destroying the BGAD chemical agent stockpile, including the option of chemical neutralization/SCWO that was selected for pilot testing at the BGCAPP. The 2002 FEIS concludes that none of the four alternatives, alone or in combination with other actions, would cause any disproportionately high and adverse human health or environmental effects to minority and low-income populations. Further, the proposed EDT facility alone would not create any adverse human health or environmental effects. Thus, it is likely that the BGCAPP facility and the EDT facility combined would not have any

disproportionately high and adverse human health or environmental effects on minority or low-income populations.

3.1.7 Noise

The BGAD is located in a rural area primarily occupied by residential, light industrial/commercial, and ranching/farming activities. The major, nearby off-post sources of noise include the vehicle traffic on U.S. Highway 421/25 and on the railroad freight line, both of which lie along the western boundary of the depot. With the exception of the on-going activities at the BGCAPP, no major noise-producing activities exist within the BGAD installation boundaries.

Noise—in the form of sound pressure levels—typically occurs over a wide spectrum of frequencies. For many types of sound measurement, these frequencies are weighted (some contribute more, and some contribute less) to determine the decibel level. The so-called “A weighting” was developed to approximate the way in which the human ear responds to sound, and this decibel weighting—expressed as dB(A)—applies to the values used in the following analysis.

No ambient noise measurements currently exist for the BGAD. Noise sources in rural environments are predominantly natural in origin, including insects, birds, wind and weather. Background noise levels in such rural areas typically range between 35 and 45 dB(A), with the 45-dB(A) value being representative of agricultural cropland with equipment operating (EPA 1978).

The Noise Control Act of 1972, along with its subsequent amendments (Quiet Communities Act of 1978, *United States Code*, Title 42, Parts 4901-4918), delegates to the states the authority to regulate environmental noise and directs government agencies to comply with local community noise statutes and regulations. Neither the Commonwealth of Kentucky nor Madison County (where the BGAD is located) has established any quantitative noise-limit regulations.

Table 3-14 shows the sound levels identified by the EPA as sufficient to protect public health and welfare from the effects of environmental noise. Since these protective levels contain a margin of safety to ensure their protective value, they should not be viewed as standards, criteria, regulations or goals. Rather, they should be viewed as levels below which there is no reason to suspect that the general population would be at risk from any of the identified effects of exposure to noise.

Table 3-14. Summary of Noise Levels that are Protective of Public Health and Welfare with a Margin of Safety.

Effect	Noise Level	Applicable Area or Zone
Hearing loss or impairment	≤ 70 dB(A) ^a	All
Outdoor activity interference and annoyance	≤ 55 dB(A) ^b	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use
	≤ 55 dB(A) ^c	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	≤ 45 dB(A) ^b	Indoor residential areas
	≤ 45 dB(A) ^c	Other indoor areas with human activities, such as schools, etc.

Notes:

^a To protect against hearing damage, one's 24-hour noise exposure at the ear should not exceed 70 dB(A).

^b The stated decibel value is the day-night sound level which includes a 10 dB nighttime weighting.

^c The stated decibel value applies to the sound energy averaged over a 24-hour period.

Source: U.S. Environmental Protection Agency, *Protective Noise Levels: Condensed Version of the EPA Levels Document*, EPA-550/9-79-100, Office of Noise Abatement and Control, Washington, D.C., 1978.

The noise levels anticipated from construction and operation of the proposed EDT facility are compared to the above standards in the following subsections; however, noise measurements are rarely available at the location of concern. Instead, noise measurements are usually obtained in close proximity to the source, and mathematical calculations must be used to estimate the noise level at some more distant location. The following equation was used in the analyses in the following subsections (Ver and Beranek 2006):

$$SPL_2 = SPL_1 + 20 \log_{10} (D_1/D_2)$$

where:

SPL₁ is the sound pressure level (i.e., noise level) at the source [in dB(A)],
SPL₂ is the sound pressure level at the distant location of interest [in dB(A)],
D₁ is the distance [in feet] from the source where the sound level was measured, and
D₂ is the distance [in feet] to the location where an estimate of SPL₂ is desired.

3.1.7.1 Impacts of noise during construction

Standard commercial and industrial practices for excavation, moving earth, and erecting concrete and steel structures would be followed during the construction of the proposed EDT facility. These activities would include noise generated due to the operation of vehicles and heavy equipment. Such construction equipment typically produces noise levels in the range of 77 to 90 dB(A) at a distance of about 50 ft from the source (EPA 1978). The dominant sources of construction noise would be generated by the engines of the construction vehicles and by the alarms that activate when those vehicles are shifted into reverse gear. The above equation indicates that at the nearest BGAD boundary—about 8600 ft to the north of the proposed EDT site in Figure 2-9, and about 6800 ft to the north of the alternate site for the EDS units—the noise level from construction activity would be between 32 and 47 dB(A). This range of noise levels is approximately the same as the background noise levels associated with rural areas, as described in Section 3.1.7. Because the anticipated noise levels at the BGAD northern boundary would be less than the 55-dB(A) established as protective for outdoor noise in residential areas (see Table 3-14), these levels would not be expected to create any activity interference or annoyance (EPA 1978).

In regard to cumulative impacts of the noise from the proposed EDT facility in combination with other noise sources, such as on-going activities at the BGCAPP, the sound pressure levels from several noise sources are not additive; instead, sound levels increase by 3 dB (regardless of frequency weighting) for each doubling of sound energy (Ver and Beranek 2006). This is consistent with experience in that noises are dominated by the loudest source. Therefore, if other on-post noise-generating activities at the BGAD are sufficient to double the sound energy, the corresponding increase of 3 dB(A) in the anticipated noise levels as described in the preceding paragraph would have little effect on the noise perceived at any off-site location.

The off-site residence nearest to the proposed EDT facility is located just beyond the BGAD boundary to the north of the EDT footprint. The maximum EDT-generated noise level expected at this location could be audible, but would not be expected to be loud enough to have any impacts in terms of activity interference, annoyance or hearing impairment.

Noise impacts from construction activities at the proposed EDT facility are thus expected to be minimal at the nearest BGAD boundary, as well at the location of the off-site residence nearest to the proposed EDT facility.

3.1.7.2 Impacts of noise during operations

Each of the four types of EDT units employs some form of detonation of the mustard munitions. These detonations occur inside thick-walled steel containment vessels; hence, any noise generated by the detonation process would be immediately dampened. In addition, the EDT unit(s) would be installed inside an environmental protection structure that would also provide some slight dampening of the noises generated inside. However, the noise analysis conducted for this EA does not take into consideration any dampening due to the environmental enclosure nor does it include any reduction in sound levels that might be associated with intervening vegetation or landforms/terrain.

The primary sources of noise during the operation of the proposed EDT facility would be the ventilation fans for the environmental protection structure and/or for the EDT unit's off-gas treatment system, and also the noise generated during the periodic testing of the back-up generators. Noise measurements for the EDT units as provided by the respective EDT vendors, and for the back-up generators, are shown in Table 3-15. Noise measurements for the operation of the EDS unit are not available; however, they would be expected to be similar to those for the TDC unit (CMA 2008a). Table 3-15 also shows the noise levels predicted at the nearest BGAD boundary as determined from the above equation.

Table 3-15 shows that the highest anticipated sound level [i.e., 53 dB(A)] would be associated with the operation of an EDT facility that used the EDS units located at the alternate site shown in Figure 2-9. This estimated sound level at the nearest BGAD boundary (to the north of the proposed EDT facility) would be below the 55-dB(A) outdoor noise level which, if not exceeded, would prevent activity interference and annoyance (EPA 1978).

In regard to cumulative impacts of the noise from the operation of the proposed EDT facility in combination with other noise sources, such as the operation of the BGCAPP, the analysis conducted in the 2002 FEIS (PMCD 2002) indicated that anticipated noise at the nearest BGAD boundary due to the operations of the BGCAPP would be less than 45 dB(A). Sound pressure levels from several noise sources are not additive; however, logarithmic equations can be used to superimpose one sound level upon another (Ver and Beranek 2006). Therefore, if such equations are used to add the sound level for the noise estimated at the nearest BGAD boundary for BGCAPP operations [i.e., approximately 45 dB(A)] to the sound level predicted for the operation of the EDS [i.e., 53 dB(A)], then the resulting combined sound level at the nearest boundary would be 54 dB(A), which would fall below the 55-dB(A) levels for outdoor areas.

Noise impacts from operation of the proposed EDT facility in conjunction with other nearby noise sources are thus expected to be within acceptable limits at the location of the off-site residence nearest to the proposed EDT facility.

Table 3-15. Predicted Noise Levels During Operation of the Proposed EDT Facility.

EDT unit/Source	Measured noise level at distance	Estimated noise level ^a [dB(A)] at nearest BGAD boundary ^b
SDC	83 dB(A) at 8 ft	22
TDC	90 dB(A) at 100 ft	51
DAVINCH	99 dB(A) at 3 ft	30
EDS ^c	N/A ^c	53
Back-up generators	86 dB(A) at 15 ft	33

Notes:

^a See Table 3-14 for established, acceptable sound levels.

^b The nearest boundary is at a distance of 8600 ft from the SDC, the TDC, and the DAVINCH, and at a distance of 6800 ft from the EDS (see Figure 2-9).

^c Sound levels during the operation of the EDS unit are not available but are expected to be similar to those of the TDC unit (see CMA 2008a).

Sources: Sound level measurements provided by the respective EDT vendors.

3.1.8 Waste Management

The construction and operation of an EDT facility using any of the four EDT systems would generate both solid and liquid non-hazardous waste, as well as small amounts of potentially hazardous solid and liquid waste. Section 3.1.8.1 discusses the environmental impacts associated with wastes generated by construction activities. Section 3.1.8.2 describes the types and quantities of waste to be generated during operations, and Section 3.1.8.3 discusses the potential impacts of such wastes upon regional waste management capabilities. Section 3.1.8.4 discusses the impacts of transporting these wastes to off-site treatment, storage and disposal facilities (TSDFs).

3.1.8.1 Waste from construction activities

The non-hazardous solid wastes generated by construction activities would primarily be in the form of building material debris (such as wood, metals, and paper) and excavation spoils. Non-hazardous liquid construction wastes would include wastewater from wash-down of equipment and sanitary waste. All non-hazardous construction waste would be disposed of

in an off-site permitted landfill. Any wastes from portable toilets would be handled through a local vendor and transported to an off-site sewage treatment facility.

Construction of the proposed EDT facility would also generate small quantities of both solid and liquid hazardous waste, such as solvents, cleaning solutions, excess paint, oils, paint thinner, and non-agent contaminated rags. Construction wastes would be collected and disposed of in accordance with U.S. Army, state, and federal regulations. Any wastes that are identified as hazardous in the RCRA regulations would be stored and disposed of as prescribed by EPA and applicable state and local regulations.

The quantities of waste from construction of the proposed EDT facility would be much smaller than those associated with BGCAPP construction because of the relative sizes of the two facilities. No significant quantities of waste would be generated by the construction of the proposed EDT facility, and no significant impacts from such wastes would be expected to occur.

3.1.8.2 Waste generated during operations

Some of the wastes resulting from the demilitarization of the mustard-filled projectiles and DOT bottles would be listed as hazardous waste by the Commonwealth of Kentucky. Therefore, for the purpose of analysis in this EA, this subsection describes the quantities of waste associated with each type of EDT system, and furthermore assumes that all such waste would require management as hazardous waste. That is, the maximum impact of managing the wastes would occur under the situation in which they were assumed to be hazardous waste (as opposed to non-hazardous waste). If these wastes were determined to be non-hazardous, then practically any applicable solid waste disposal facility would be able to manage such wastes.

Before an evaluation can be made as to whether existing regional TSDf capabilities are adequate for the management of the anticipated quantities of waste from the proposed EDT facility, the numerical quantities of such wastes must be known. The following paragraphs present the waste data for the proposed EDT facility as a whole, then for each type of EDT system. The quantities of waste associated with each type of EDT system are shown in Table 3-16, and these waste quantities are used in the analyses in Section 3.1.8.3.

Waste Quantities Associated with the Proposed EDT Facility. Regardless of which type of EDT system is employed at the proposed EDT facility, each EDT unit would be operated within an environmental enclosure. Small amounts of hazardous contaminants (including mustard agent and/or reagent vapors) could be released to the atmosphere within the environmental enclosure. However, the enclosure to be constructed around each EDT

**Table 3-16. Waste Anticipated to be Generated during EDT Operations
for Each Type of EDT System.**

Name of EDT Unit and Type of Waste	Waste Quantity
<i>Static Detonation Chamber (SDC)</i>	
• Dust collected from the cyclone and dust collection system	10 kg/day
• Spent calcium carbonate and salts from the baghouse filter	40 kg/day
• Spent filter media	7 tons/yr
<i>Total liquid waste for SDC unit^a</i>	<i>0 tons/yr^a</i>
<i>Total solid waste for SDC unit^b</i>	<i>23 tons/yr</i>
<i>Transportable Detonation Chamber (TDC), per unit</i>	
• Pea gravel (to cover floor of chamber) ^c	24,000 lb
• Hydrated-lime salts from the off-gas treatment system (per unit)	480 lb/day
• Spent candle filters from off-gas treatment system (per unit)	18 tons/yr
<i>Total liquid waste for two TDC units^a</i>	<i>0 tons/yr^a</i>
<i>Total solid waste for two TDC units^b</i>	<i>197 tons/yr</i>
<i>Detonation of Ammunition in Vacuum Integrated Chamber (DAVINCH)</i>	
• Water consumption (per unit) ^d	46 gal/day
• Disposable inner chamber liner (per unit) ^c	7 tons
• Dust collected in the filters (per unit) ^c	3 tons
• Spent filter media (per unit) ^c	47 tons
<i>Total liquid waste for two DAVINCH units^d</i>	<i>110 tons/yr</i>
<i>Total solid waste for two DAVINCH units^b</i>	<i>115 tons/yr</i>
<i>Explosive Destruction System (EDS), per unit</i>	
• Liquid waste (monoethanolamine-based hydrolysate)	73 gal/detonation
• Rinse water (from chamber clean-out activities) ^a	53 gal/detonation
• Spent filter media	10 lb/detonation
<i>Total liquid waste for seven EDS units^d</i>	<i>1815 tons/yr</i>
<i>Total solid waste for seven EDS units^b</i>	<i>17 tons/yr</i>

Notes:

^a Neither the SDC unit nor the TDC unit generate any liquid waste during operations. All of the process water used by these units is exhausted out the stack in the form of water vapor.

^b For the purpose of analysis in this EA, all solid wastes are assumed to become solid hazardous waste.

^c Represents the total quantity needed during the operational lifetime of the specified EDT unit.

^d See Table 3-7 for water usage data for each type of EDT unit. For the purpose of analysis in this EA, the entire quantity of water usage is assumed to become liquid hazardous waste.

Sources: Data provided by EDT vendors.

unit would include a carbon filtration system with approximately 800 pounds of carbon filter media designed to remove such vapors and to ensure that emissions to the atmosphere are safe. Because no contamination is expected to escape from the EDT units, the 800 pounds of carbon filter media are not expected to be replaced during the operational lifetime of the proposed EDT facility; however, the filter media would require disposition after the processing of the entire inventory of mustard-filled 155mm projectiles and DOT bottles has been completed. Assuming that seven such enclosures are constructed to surround the EDS units (as would be the case if seven EDS units were to be installed), an upper-bound total of 5,600 pounds (i.e., 2.8 tons) of spent carbon filter media would be generated by these environmental enclosures.

The use of any of the four types of EDT units would generate scrap metal from the munition bodies. However, the total quantity of such scrap metal is fixed by the inventory of munitions currently stored at the BGAD. Approximately 675 tons of scrap metal are associated with the mustard-filled munitions being stored at the BGAD. Based on the Army's previous experience with chemical weapons demilitarization facilities and other EDT operations, it is anticipated that, regardless of which type of EDT unit were to be used in the proposed EDT facility, this scrap metal would be shipped off-site to a metals recycling facility for smelting and would, therefore, not be considered to be waste. This recycled scrap metal is therefore not included in the quantities of waste that are evaluated in this section for off-site management and disposal.

Other process wastes would include any PPE that became contaminated if there were a spill or leak. In the event used PPE cannot be laundered for reuse, it would be containerized and shipped to a permitted TSDF. The quantities of any such PPE to be shipped off site over the lifetime of the proposed EDT facility are expected to be very small in comparison to the other similar wastes to be generated by the BGCAPP.

In addition to wastes directly associated with the processing of the mustard-filled munitions, secondary wastes from supporting functions would also be generated at the proposed EDT facility. These wastes include wooden munition storage pallets, plastics (such as hoses), maintenance equipment and supplies, and spent decontamination solutions. These types of secondary wastes may or may not be contaminated with chemical agent residues, and the quantities of each type of such waste would be smaller for the proposed EDT facility than for the BGCAPP.

In the event of personnel exposure to mustard agent, the ensuing decontamination procedures would generate up to about 20 gal of spent decontamination solutions (consisting of water, bleach, and soap). Such procedures are expected to be needed very infrequently, and the resulting total quantities of spent decontamination solutions generated over the lifetime of the proposed EDT facility is therefore expected to be very small in comparison to the other similar wastes to be generated by the BGCAPP.

A 2007 report by the National Research Council concluded that it is both technically feasible and advantageous for the Army to use off-site TSDFs to manage secondary wastes from its chemical weapons destruction facilities (NRC 2007). The NRC report recommended that the Army pursue off-site shipment, as long as the appropriate packaging, shipping, monitoring, and treatment restrictions are enforced and adhered to (NRC 2007).

Waste from the SDC Unit. If the SDC unit were to be used at the proposed EDT facility, then only a single such unit would be installed and operated. As discussed in Section 3.1.2.3, the SDC does not generate any liquid waste during operations. Table 3-16 shows the lifetime quantity of solid waste associated with the operation of the SDC unit to be about 23 tons. For the purpose of this analysis, this quantity of waste is assumed to be generated in a single year, and all of this waste is analyzed here as though it were classified as hazardous waste.

Waste from the TDC Unit. If the TDC unit were to be used at the proposed EDT facility, then two such units would be installed and operated. As discussed in Section 3.1.2.3, the TDC does not generate any liquid waste. Table 3-16 shows the quantity of solid waste associated with the operation of the two TDC units to be 197 tons/yr, and all of this waste is assumed to be classified as hazardous waste (for the purpose of this analysis). It should be noted in Table 3-16 that 24,000 pounds of pea gravel is used to initially cover the floor of each TDC unit (see Section 2.1.1.2), and it would not be removed until the end of the operational lifetime of the EDT facility. Nevertheless, the total quantity of pea gravel was included in this analysis to represent the worst-case quantities of solid waste that might be generated by each TDC unit in any single year.

Waste from the DAVINCH Unit. If the DAVINCH unit were to be used at the proposed EDT facility, then two such units would be installed and operated. For the purpose of this analysis, all of the water used by the two DAVINCH units (as discussed in Section 3.1.2.3) is assumed to become hazardous liquid waste. As shown in Table 3-16, the quantity of this liquid waste would be 110 tons/yr during the operation of an EDT facility using two DAVINCH units. Table 3-16 also shows the quantity of solid waste associated with the operation of the two DAVINCH units to be 115 tons/yr, and all of this waste is assumed to be classified as hazardous waste (for the purpose of this analysis).

Waste from the EDS Unit. If the EDS unit were to be used at the proposed EDT facility, then seven such units would be installed and operated. For the purpose of this analysis, all of the water used by the EDS units (as discussed in Section 3.1.2.3) is assumed to become hazardous liquid waste. In addition, 73 gal of liquid waste would be generated by

the reagent chemicals to be used for each detonation in a single EDS unit. As shown in Table 3-16, the total quantity of liquid waste generated by the seven EDS units would therefore be 1815 tons/yr, assuming that two detonations inside each of the seven EDS unit occur daily. Table 3-16 also shows the quantity of solid waste associated with the operation of the seven EDS units to be 17 tons/yr, and all of this waste is assumed to be classified as hazardous waste (for the purpose of this analysis).

Comparison of Waste Quantities to Those from BGCAPP Operations. The anticipated quantities of solid waste from the operation of the BGCAPP would total 4138 tons over its operational lifetime. The average quantity of solid waste generated by the BGCAPP over its assumed 3-year operational lifetime would therefore be 1380 tons/yr.

The upper-bound quantity of solid waste to be generated by the proposed EDT facility would be 197 tons/yr as shown in Table 3-16 (for the two TDC units). The addition of up to 2.8 tons/yr of spent carbon filter media from the environmental enclosures (for seven EDS units) would bring the anticipated upper-bound quantity of solid waste for the proposed EDT facility to about 200 tons/yr. This quantity would represent an increase of about 15 percent in the 1380 tons/yr of solid waste anticipated from the operation of the BGCAPP alone. The significance of this quantity of solid waste is addressed in Section 3.1.8.3, below.

The liquid wastes to be generated at the BGCAPP would include process waste and sanitary waste. The sanitary waste would be handled through the BGAD's sanitary waste treatment system, as described in Section 3.1.2.2. The liquid process waste from the BGCAPP would total 86,180 tons over its operational lifetime, and these wastes would require further treatment or management. The average quantity of liquid hazardous waste generated by the BGCAPP over its assumed 3-year operational lifetime would therefore be about 28,730 tons/yr. From Table 3-16, the maximum quantity of liquid wastes among the four types of EDT systems would be 1815 tons/yr (associated with the multiple EDS units). This quantity would represent an increase of about 6 percent in the 28,730 tons/yr of liquid hazardous waste already anticipated from the operation of the BGCAPP. The significance of managing and disposing of this quantity of liquid waste is addressed in the following section.

3.1.8.3 Management and disposition of waste

The hazardous-waste management capacity in the United States is limited. For the purpose of analysis in this EA, the waste management data for Kentucky and its surrounding seven states (i.e., Illinois, Indiana, Missouri, Ohio, Tennessee, Virginia, and West Virginia) were examined to determine the waste-management capability that might be available for use in managing the waste anticipated from the proposed EDT facility (EPA 2012c).

Table 3-17 shows the best available EPA data (EPA 2012c) for the types of hazardous waste management facilities in Kentucky and the surrounding states. The following analysis compares the anticipated upper-bound annual waste quantities from the proposed EDT facility—in combination with anticipated wastes from the BGCAPP and from other activities at the BGAD—with the quantities of similar wastes managed within this region. The analysis in this subsection is built around the estimates of annual waste as presented in Section 3.1.8.2. The analysis assumes that all such waste would be classified as hazardous waste. If these wastes were found not to be hazardous, the analysis presented below would nevertheless bound the quantities of waste to be disposed of.

Management of Solid Waste. As shown in Table 3-16, the use of the two TDC units would result in the largest quantity of solid waste (i.e., 197 tons/yr) among any of the four types of EDT systems under consideration. The addition of up to 2.8 tons/yr of spent carbon filter media from the environmental enclosures (for seven EDS units) would bring the anticipated upper-bound quantity of solid waste to about 200 tons/yr. An additional 1380 tons/yr of solid hazardous waste from the BGCAPP and 75 tons/yr of solid hazardous waste from other activities at the BGAD (data from 2011) would bring the upper-bound grand total of solid hazardous waste to 1655 tons/yr. It should be noted that the anticipated 75 tons/yr of BGAD solid waste does not include approximately 170 tons/yr of solid hazardous waste (data from 2011) that is assumed to be generated at the BGAD and treated, recycled or disposed of on site. The 75 tons/yr included in this analysis represents the quantity of BGAD solid hazardous waste that is assumed to be shipped off-site for further management.

If this total quantity of 1655 tons/yr of solid waste were to be disposed of as hazardous waste in landfills, the data in Table 3-16 show that would greatly exceed the quantity of hazardous waste disposed of annually in Kentucky by landfill/surface impoundment; however, this 1655 tons/yr of solid waste would represent an increase of only about 1 percent in the total quantity of solid waste already being managed by such methods within Kentucky and the surrounding seven states (i.e., 1655 tons/yr compared to 166,393 tons/yr). This small increase would not create a significant impact to regional hazardous waste capabilities for the management of solid waste from the proposed EDT facility in conjunction with similar wastes from the BGCAPP and the BGAD waste streams.

Management of Liquid Waste. As shown in Table 3-16, the use of the multiple EDS units would result in the largest quantity of liquid waste (i.e., 1815 tons/yr) among any of the four types of EDT systems under consideration. An additional 28,730 tons/yr of liquid hazardous waste from the BGCAPP and 41 tons/yr of liquid hazardous waste from

Table 3-17. RCRA hazardous waste managed in Kentucky and surrounding states during 2011 [numerical units are in tons]

Management method	Illinois	Indiana	Kentucky	Missouri	Ohio	Tennessee	Virginia	West Va.	Total ^a
Aqueous inorganic treatment	57,235	67,339	2	472	14,509	N/A ^b	N/A	39	139,596
Aqueous organic treatment	49,929	54,957	31,474	3,131	398	N/A	N/A	N/A	139,889
Deepwell/underground injection	439,036	427,145	N/A	N/A	1,166,876	N/A	N/A	N/A	2,033,057
Energy recovery	17	238,509	15,650	129,686	88,804	561	N/A	13,697	486,924
Fuel blending	20,968	20,882	43,265	2,721	109,089	18,501	2,578	N/A	218,004
Incineration	11,255	26,215	3,382	174,492	126,218	11,637	N/A	6,214	359,413
Land treatment/Application/Farming	N/A	N/A	N/A	N/A	N/A	8	N/A	N/A	8
Landfill/Surface impoundment ^c	828	100,115	17	7,623	48,830	1,881	N/A	7,099	166,393
Metals recovery	124,989	7,175	25	1,136	3,749	9,925	4	1,506	148,509
Other disposal	8,865	1	7	N/A	17,080	N/A	57	281	26,291
Other recovery	51	27	6,951	3,765	19,312	1	N/A	N/A	30,107
Other treatment	1,229	16,082	370,687	169	4,348	347	254	104	393,220
Sludge treatment	0 ^b	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 ^b
Solvents recovery	35,109	24,360	708	5,295	29,963	492	596	N/A	96,523
Stabilization	120,852	152,714	5,671	28	51,303	5,738	N/A	N/A	336,306
Total ^a	870,361	1,135,520	477,841	328,518	1,680,479	49,091	3,489	28,941	4,574,240

^a Waste quantities may not sum to the number shown due to rounding.

^b N/A means that no data are available; a numerical zero entry indicates that the waste quantities round to a value less than 1.0 ton but greater than 0.0 tons.

^c EPA does not distinguish between landfill and surface impoundment in the biennial reports.

Source: *State Detail Analysis; The National Biennial RCRA Hazardous Waste Report (Based on 2011 Data)*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C., December 2012; available on-line at <http://www.epa.gov/epawaste/inforesources/data/br11/state11.pdf> (Note: The waste quantities used in the above table are from Table 11 of each state report).

other activities at the BGAD (data from 2011) would bring the grand total of liquid hazardous waste to 30,586 tons/yr. The following analysis examines several methods of managing and disposing of this quantity of liquid waste, even though this waste would likely not be suitable for management in landfills or surface impoundments.

If liquid waste from the proposed EDT facility were to be disposed of as hazardous waste in landfills/surface impoundments⁵, the data in Table 3-17 show that the 30,586 tons/yr of liquid waste—in combination with the aforementioned 1655 tons/yr of solid waste—would represent an increase of about 19 percent in the quantity of hazardous waste disposed of by landfill/surface impoundment within Kentucky and the surrounding seven-state region [i.e., 30,586 tons/yr (liquid) plus 1655 tons/yr (solid), as compared to 166,393 tons/yr]. While existing commercial hazardous waste management facilities in the region might be able to expand their operations to accommodate this large quantity of such waste, it is uncertain as to whether the additional waste that would result from the proposed EDT facility in combination with the wastes anticipated from the BGCAPP and BGAD waste streams would have significant effects on regional landfill/surface impoundment waste-management capabilities.

As noted above, the liquid waste from the proposed EDT facility would likely not be suitable for disposal by landfill/surface impoundment. The cumulative 30,586 tons/yr of liquid waste would represent an increase of about 1.5 percent in the existing quantity of hazardous waste disposed of annually by deep well injection in the 8-state region (i.e., 30,586 tons/yr compared to 2,033,057 tons/yr). This small increase would not be expected to create any significant impacts to regional hazardous waste management capabilities for liquid hazardous waste.

If the liquid waste from the proposed EDT facility were to require stabilization as part of its management strategy, the data in Table 3-17 show that the cumulative quantities of such liquid waste (i.e., 30,586 tons/yr) would represent about 9 percent of the existing quantity of hazardous waste disposed of annually by stabilization in the region (i.e., 30,586 tons/yr compared to 336,306 tons/yr). While existing commercial hazardous waste management facilities in the region might be able to expand their operations to accommodate this large quantity of such liquid waste, it is uncertain as to whether the additional waste that would result from the stabilization process would have significant effects on regional waste management capabilities. However, it should be noted that the stabilization process involves combining the waste with water and a binder such as Portland cement. If the liquid waste

⁵ The EPA's waste management source data (see EPA 2012c) provide only a single numerical entry for the combined categories of "landfill" and "surface impoundment." Therefore, no further breakdown is available for use in this analysis, even though some types of wastes from the proposed EDT facility that would be appropriate for landfill would not be appropriate for disposal by surface impoundment, and vice versa.

from the proposed EDT facility were to be used in the process to stabilize other wastes, then the need for fresh water for the stabilization process might be greatly diminished or eliminated entirely. Thus, the use of liquid waste from the proposed EDT facility in the waste stabilization process might be viewed by some TSDFs as advantageous and/or desirable.

Conclusions Regarding the Management and Disposition of Waste. Based on the above analyses, adequate waste management capacity appears to exist at TSDFs within Kentucky and the surrounding seven states to accommodate the quantities of hazardous wastes anticipated from operation of the proposed EDT facility, as well as the cumulative wastes from the operation of the BGCAPP and wastes generated elsewhere at the BGAD. No adverse impacts from the off-site management of such solid or liquid wastes would be expected.

3.1.8.4 Off-site shipment of wastes

Two other issues, in addition to the waste management issues discussed in Section 3.1.8.3, are relevant to the potential environmental impacts of off-site shipment of wastes from the BGAD: the risk of an accident during transportation and the potential human health and environmental impacts in the event of a spill or release during a transportation accident. These issues are discussed in this subsection.

As discussed in Section 3.1.8.2, scrap metal would be generated in association with the destruction of the chemical munitions that are being stored at the BGAD. The total quantity of scrap metal associated with the entire BGAD inventory of chemical munitions is about 3300 tons. This scrap metal would be recycled or smelted for reuse; hence, it is not considered to be waste. Nevertheless, this scrap metal would presumably be shipped off-site to an appropriate recycling or smelting facility. These off-site shipments of scrap metal are included in the analysis in this subsection.

Table 3-18 summarizes the number of waste shipments that would be associated with the wastes (whether hazardous or non-hazardous) to be generated by the proposed EDT facility, the BGCAPP, and other activities at the BGAD. It is estimated that a total of about 5000 waste shipments from the BGAD would be required over the operational lifetimes of both the proposed EDT facility and the BGCAPP. If these shipments were to occur uniformly over the assumed 3-year operational lifetime of the BGCAPP, then the average number of waste shipments would be between 4 and 5 shipments per day. As discussed in Section 3.1.5.4, this level of additional traffic on the roads near the BGAD would not create any significant impacts to local traffic.

Table 3-18. Cumulative waste shipments from the BGAD during the operational lifetimes of the proposed EDT facility and the BGCAPP.

Waste Source and Type	Waste Quantity (tons)	Total Number of Waste Shipments ^a
<i>Proposed EDT Facility ^b:</i>		
Solid waste	200	20
Liquid waste	1,815	86
<i>BGCAPP:</i>		
Solid waste	4,138	414
Liquid waste	86,180	4,056
<i>Scrap Metal (munition parts)</i>	3,300	330
<i>Other BGAD Activities ^c:</i>		
Solid hazardous waste	228	23
Liquid hazardous waste	123	6
<i>Grand Total</i>		<i>4,935</i>

Notes:

^a Solid wastes are assumed to be shipped in 10-ton loads. Liquid wastes are assumed to be shipped in 5,000-gal tanker trucks, assuming the liquid waste weighs 8.5 lb/gal.

^b Data represent upper-bound quantities for the proposed EDT facility as obtained from Section 3.1.8.2 and Table 3-16.

^c Data represent the total quantity of BGAD hazardous waste to be shipped off-site during the assumed 3-year operational lifetime of the BGCAPP, assuming 76 tons/yr of solid hazardous waste and 41 tons/yr of liquid hazardous (as were generated at and shipped from the BGAD in 2011).

Wastes from the BGAD have previously been shipped to various off-site locations for management and/or disposal. Historically, such shipments have been sent to TSDF facilities located as close as 25 mi to the BGAD; however, one waste shipment went to a TSDF 1800 mi away. The majority of these waste shipments have been sent to TSDFs that are between 160 mi and 850 mi from the BGAD. For the purpose of analysis in this EA, it is assumed that each of the 5000 waste shipments shown in Table 3-18 would travel a one-way distance of 850 mi. This analysis thus provides an upper bound on the total number of

vehicle miles that might be traveled by the cumulative number of off-site waste shipments from the BGAD, from the BGCAPP, and from the proposed EDT facility combined.

The risk of a transportation accident. The U.S. Department of Transportation (DOT) has established regulations at 49 CFR Part 177 regarding the transportation of hazardous materials on public highways. These regulations include provisions that provide an appropriate level of safety and that protect the public during such transportation activities. While the DOT regulations do not require that a transportation risk assessment be conducted for hazardous waste shipments, transportation risk assessments are sometimes prepared to identify and assess the potential risks to members of the public due to accidents during the shipment of hazardous materials.

The Army has conducted several transportation risk assessments for the off-site shipment of hazardous materials from its chemical agent and munitions destruction facilities. This subsection summarizes these previous studies and provides a numerical calculation of risk based on the most recent information available about off-site shipments from the BGAD and about national accident statistics for the types of large trucks that would be used for such shipments. The Army's previous transportation risk assessments include:

- An analysis of the transportation of liquid effluent (also called hydrolysate) from the Newport Chemical Depot in Indiana to support NEPA requirements (Zimmerman et al. 2003),
- An analysis of the transportation of hydrolysate from the Newport Chemical Depot to support a transportation safety plan (DuPont 2004), and
- An analysis of the transportation of secondary wastes from the Army's chemical agent destruction facilities to support risk management decisions (CMA 2008b).

The National Research Council (NRC) has completed a review of the disposal of the Army's chemical agent secondary wastes (NRC 2007), and that review included a critique of the first two transportation risk assessments described above. The NRC concluded that the approach taken in the two reports in regard to the use of truck crash rates per mile traveled was an appropriate and acceptable approach. A similar approach was taken in the third transportation risk assessment listed above. Thus, this subsection focuses on an analysis of transportation risk using truck crash statistics based upon the number of miles traveled. Therefore, the number of potential accidents during off-site waste shipments from the BGAD was evaluated against statistics available from the DOT in regard to the transportation of hazardous materials. As described below, hazardous materials transporters have a better-than-average safety record.

Crash statistics for large trucks are maintained in the DOT's Fatality Analysis and Reporting System (FARS). This system compiles all types of data from accidents as collected from police reports. The latest version of the FARS report for large trucks (FMCSA 2012a) was used as the basis for the accident analysis presented in this subsection. Large trucks are defined as trucks with a gross vehicle weight more than 10,000 pounds. The types of vehicles to be used in the transportation of BGAD wastes fall into this category.

The following data are given in the FARS trends report for large-truck crashes that occurred in 2010, the latest year for which such data are available (FMCSA 2012a, 2012b):

- In 2010, large trucks accounted for 10 percent of all vehicle miles traveled and 4 percent of all registered vehicles in the United States.
- In all motor vehicle crashes in the United States in 2010, large trucks represented 8 percent of vehicles in fatal crashes, 2 percent of vehicles in injury crashes, and 3 percent of vehicles in property-damage-only crashes.
- Of the 266,000 police-reported crashed involving large trucks, only about 1 percent (3,261) resulted in one or more fatalities, and about 21 percent (56,000) resulted in one or more non-fatal injuries.
- Of the 32,885 people killed in motor vehicle crashes in 2010, 11 percent (3,675) died in crashes involving a large truck.
- Only 3 percent of the large trucks involved in fatal crashes—and 2 percent of the large trucks in non-fatal crashes—were carrying hazardous materials. Hazardous material was released from the cargo compartment in 34 percent of the fatal crashes and 10 percent of the non-fatal crashes.
- In two-vehicle fatal crashes involving a large truck and a passenger vehicle, the passenger vehicles struck the large trucks in the rear approximately three times more often than the large trucks struck the passenger vehicles in the rear (76 percent vs. 24 percent).
- Rollover was the first harmful event (the first event during a crash that caused injury or property damage) in only 4 percent of all fatal crashes involving large trucks and in only 2 percent of all non-fatal crashes involving large trucks.

The sets of FARS data from the ten-year period 2001 to 2010 are summarized in Table 3-19. These data show the number of accidents involving large trucks, as well as the consequences of those accidents (as measured by the categories of fatalities, injuries, and property-damage-only). The data on the numbers of accidents in Table 3-19 have been expressed on a “per vehicle mile traveled (VMT)” basis so that the resulting rates can be applied to the potential routes to be traveled by the BGAD waste shipments.

Table 3-19. Accident Statistics for Crashes over the Past Ten Years That Have Involved Large Trucks.***Part A. Large truck crashes of all types and crashes with only property damage***

Year	Vehicle miles traveled (VMT), in millions	All types of accidents		Number of accidents with property damage only	
		Number of crashes	Accident rate (crashes/VMT)	Number of crashes	Accident rate (crashes/VMT)
2001	208,928	409,000	2.0×10^{-6}	319,000	1.5×10^{-6}
2002	214,603	416,000	1.9×10^{-6}	322,000	1.5×10^{-6}
2003	217,876	436,000	2.0×10^{-6}	347,000	1.6×10^{-6}
2004	220,811	399,000	1.8×10^{-6}	312,000	1.4×10^{-6}
2005	222,523	424,000	1.9×10^{-6}	341,000	1.5×10^{-6}
2006	222,513	368,000	1.6×10^{-6}	287,000	1.3×10^{-6}
2007	304,178	393,000	1.3×10^{-6}	317,000	1.0×10^{-6}
2008	310,680	365,000	1.2×10^{-6}	297,000	9.6×10^{-7}
2009	288,306	286,000	9.9×10^{-7}	232,000	8.1×10^{-7}
2010	286,585	266,000	9.3×10^{-7}	207,000	7.2×10^{-7}

Note: A large truck is one with a gross vehicle weight over 10,000 pounds.

Source: Data taken from Tables 4, 7 and 10 in Federal Motor Carrier Safety Administration (FMCSA), *Large Truck and Bus Crash Facts 2010*, FMCSA-RRA-12-023, Analysis Division, FMCSA, U.S. Department of Transportation, Washington, D.C., August 2012; Available on-line at <http://ai.fmcsa.dot.gov/CarrierResearchResults/PDFs/LargeTruckandBusCrashFacts2010.pdf>

Table 3-19. (continued)

Part B. Large truck crashes with fatalities or injuries

Year	Vehicle miles traveled (VMT), in millions	Fatal crashes				Crashes with injuries			
		Number of fatal crashes	Accident rate (fatal crashes/VMT)	Number of fatalities	Fatality rate (fatalities/VMT)	Number of crashes with injuries	Accident rate (injurious crashes/VMT)	Number of injuries	Injury rate (injuries/VMT)
2001	208,928	4,451	2.1×10^{-8}	5,111	2.5×10^{-8}	86,000	4.1×10^{-7}	131,000	6.3×10^{-7}
2002	214,603	4,224	2.0×10^{-8}	4,939	2.3×10^{-8}	90,000	4.2×10^{-7}	130,000	6.0×10^{-7}
2003	217,876	4,335	2.0×10^{-8}	5,036	2.3×10^{-8}	85,000	3.9×10^{-7}	122,000	5.6×10^{-7}
2004	220,811	4,478	2.0×10^{-8}	5,235	2.4×10^{-8}	83,000	3.8×10^{-7}	116,000	5.3×10^{-7}
2005	222,523	4,551	2.1×10^{-8}	5,240	2.4×10^{-8}	78,000	3.5×10^{-7}	114,000	5.1×10^{-7}
2006	222,513	4,350	2.0×10^{-8}	5,027	2.3×10^{-8}	77,000	3.4×10^{-7}	106,000	4.8×10^{-7}
2007	304,178	4,204	1.4×10^{-8}	4,822	1.6×10^{-8}	72,000	2.4×10^{-7}	101,000	3.3×10^{-7}
2008	310,680	3,754	1.2×10^{-8}	4,245	1.4×10^{-8}	64,000	2.1×10^{-7}	90,000	2.9×10^{-7}
2009	288,306	2,983	1.0×10^{-8}	3,380	1.2×10^{-8}	51,000	1.8×10^{-7}	74,000	2.6×10^{-7}
2010	286,585	3,261	1.1×10^{-8}	3,675	1.3×10^{-8}	56,000	1.9×10^{-7}	80,000	2.8×10^{-7}

Note: A large truck is one with a gross vehicle weight over 10,000 pounds.

Source: Data taken from Tables 4 and 7 in Federal Motor Carrier Safety Administration (FMCSA), *Large Truck and Bus Crash Facts 2010*, FMCSA-RRA-12-023, Analysis Division, FMCSA, U.S. Department of Transportation, Washington, D.C., August 2012; Available on-line at <http://ai.fmcsa.dot.gov/CarrierResearchResults/PDFs/LargeTruckandBusCrashFacts2010.pdf>

Table 3-20 shows the results of the statistical accident calculations based upon the accident rates for year 2010 as shown in Table 3-19. For the assumed one-way transportation distance (i.e., 850 miles), Table 3-20 shows that the number of anticipated accidents of all types would be small (i.e., 7.9) during the shipment of the cumulative quantity of waste from the BGAD for the proposed EDT facility in conjunction with the BGCAPP and the other hazardous wastes generated at the BGAD, combined. Statistically, far less than one of these accidents (i.e., 0.10) would be expected to result in fatalities, and less than two of these accidents (i.e., 1.6) would be expected to result in injuries.

The FARS statistics, as used in this analysis, indicate that no significant number of crashes would be expected to occur during the off-site shipments from the BGAD during the lifetimes of the proposed EDT facility and the BGCAPP.

Consequences of a transportation accident; Injuries and fatalities. In addition to data on the frequency of crashes involving large trucks, Table 3-19 also presents the data for the consequences of those accidents (as measured by the categories of injuries, fatalities, and property-damage-only). The data on the theoretical numbers of injuries and fatalities in Table 3-20 have been expressed on a “per VMT” basis so that the resulting rates can be

Table 3-20. Statistically Anticipated Accidents and Their Consequences Due to Off-Site Waste Shipments during the Operational Lifetimes of the Proposed EDT Facility and the BGCAPP.

Number of one-way trips	Assumed one-way distance (miles)	Total accidents of all types	Predicted numbers of accidents			Accident consequences	
			Accidents with property damage only	Accidents with injuries	Accidents with fatalities	Expected number of injuries	Expected number of fatalities
5,000	850	7.9	6.1	1.6	0.10	2.4	0.11

Notes:

(1) The number of shipments in the above table includes the cumulative number of waste shipments from the proposed EDT facility in conjunction with wastes from the BGCAPP and from other activities at the BGAD. Both the number of one-way trips and the assumed one-way distance in the above table represent a reasonable upper bound on the number of anticipated waste shipments and their transportation distances. The actual numbers are expected to be less than the numbers shown in the above table.

(2) The accident rates used for the calculations in the above table were taken from the data for 2010 as shown in Table 3-19.

applied to the transportation distances to be traveled by BGAD waste shipments. Table 3-20 shows the results of the accident consequence calculations based upon the injury and fatality rates for the year 2010 (as shown in Table 3-19). For the assumed one-way transportation distances to be traveled by the BGAD wastes, Table 3-20 shows that the number of statistically anticipated injuries would be less than three during the lifetimes of the proposed EDT facility and the BGCAPP. The total number of fatalities expected from accidents involving off-site waste shipments during this period would statistically be much, much less than 1.

The FARS statistics, as used in this analysis, indicate that no significant number of injuries or fatalities would be expected to occur during the off-site shipment of wastes from the BGAD over the lifetime of the proposed EDT facility, even when the shipment of wastes from the BGCAPP and wastes from other activities at the BGAD are included.

Consequences of a transportation accident; Impacts from spills. In the unlikely event of an accident involving the shipments of waste, the waste could be released from its container and escape into the environment. Any releases of solid wastes would be expected to be contained within a highly localized area in the immediate vicinity of the accident. While some of the anticipated liquid wastes may exhibit toxicity (under RCRA) due to their heavy metal content, spilled brines would not become the source of any significant airborne toxic hazard. Hence, the potential for environmental impacts from spills would be limited to localized contamination of surface soils and/or to liquid run-off that might reach surface waters or groundwater. Appropriate emergency response actions, as described in the following paragraphs, would be expected to eliminate or reduce the impacts of accidental spills of any liquid or solid waste.

The containers and vehicles used for hazardous waste transport from the BGAD would be appropriately placarded and labeled prior to leaving the depot. Furthermore, wastes shipped off-site would be accompanied by either a hazardous waste manifest or bill of lading. All shipping papers would conform to applicable federal, state, and local regulations in order to provide first responders with the necessary information in the event of an accidental spill or release. In such instances, emergency responders are trained to establish isolation and protective action distances for accidents involving hazardous material and to take appropriate actions to limit the impact of such accidents.

Under the provisions of DOT regulations at 49 CFR Part 172, licensed carriers and shippers are required to provide information to emergency responders about the hazardous nature of their shipments. Specifically, Subpart G of these regulations relates to “Emergency

Response Information” that is to be carried by each transporter, and Subpart H relates to “Training” for hazardous materials transport personnel.

Conclusions regarding the off-site shipment of waste. The risk of transportation accidents during the off-site shipment of waste from the proposed EDT facility has been evaluated and has been found not to be significant. Furthermore, the consequences of any such accidents have also been statistically evaluated and found not to be significant. Because (1) nationwide, there are millions of highway shipments of hazardous materials each year, for which the states already provide capable emergency response, and (2) some of these shipments involve chemicals (such as sulfuric acid) that present far more toxic hazards than the wastes to be shipped from the BGAD, it is concluded that the Army’s intent to ship wastes from the BGAD to permitted TSDFs does not pose any unique safety concerns or unacceptable environmental impacts relative to those associated with routine commercial and trade industry hazardous waste shipments.

Based on the transportation analyses conducted in this EA, no significant number of accidents would be expected to occur during the off-site shipment of waste from the proposed EDT facility, nor would there be any significant consequences if such accidents were to actually occur.

3.1.9 Resource Requirements

Operation of the proposed EDT facility would require the consumption of electricity, natural gas, diesel fuel and/or fuel oil, water, and reagent chemicals for some types of EDT units and/or their off-gas treatment systems. Table 3-21 shows the numerical quantities that would be required for each of these resources; however, the process water requirements are shown in Table 3-7. Table 3-21 also shows the resource requirements for the BGCAPP on an annual basis. The 2002 FEIS found no significant impacts associated with the projected resource consumption requirements of the BGCAPP.

The quantities of electricity, natural gas, diesel fuel and/or fuel oil, and reagent chemicals that are required for the operation of the proposed EDT facility would be small in comparison to the quantities of the resources to be used during BGCAPP operations, and none of these commodities is in short supply. For these reasons, the potential impacts to the resources required to operate the proposed EDT facility would not be expected to be significant.

Table 3-21. Resource Requirements for the EDT Systems in Comparison to BGCAPP Requirements.

Resource Required (per EDT unit or for the BGCAPP as a whole)	Type of EDT Unit				
	Static Detonation Chamber (SDC)	Transportable Detonation Chamber (TDC)	Detonation of Ammunition in Vacuum Integrated Chamber (DAVINCH)	Explosive Destruction System (EDS)	Blue Grass Chemical Agent- Destruction Pilot Plant (BGCAPP)
Electricity	700 kW	200 kW	432 kW	55 kW	60,000 kWh
Propane/natural gas	1,800 ft ³ /hr	7 ft ³ /hr	110 ft ³ /hr	N/R	6,000 ft ³ /hr
Water	(a)	(a)	(a)	(a)	(a)
Diesel fuel and fuel oil	17.8 gal/hr	20 gal/hr	N/A	20 gal/hr	6 gal/hr
Reagent chemicals and other substances	NaOH: 1.6 gal/hr	Oxygen: 12,000 ft ³ /day	Oxygen: 2,400 ft ³ /day	MEA reagent: 73 gal/day	NaOH: 190 tons/yr ^b
	Bicarbonate and activated carbon: 9 lb/hr	Hydrated lime: 480 lb/day	Nitrogen: 400 ft ³ /day		
		Pea gravel: 12 tons (one time)			

Notes:

N/A indicates that no data were provided by the vendor for the indicated type of EDT unit.

N/R indicates that use of the specified resource is not required for the indicated type of EDT unit.

^a Process water requirements are shown in Table 3-7 for the EDT units and are discussed in Section 3.1.2.4 for the BGCAPP.

^b This value derived from the average quantity of nerve agent to be processed annually by the BGCAPP and the assumed quantity of NaOH required to react with these nerve agents in the chemical neutralization process.

Sources: Data for EDT units provided by the respective EDT vendors. BGCAPP data obtained from Table 3.1 in PMCD (2002).

3.1.10 Decommissioning and Closure

The activities to be undertaken for decommissioning and closure of the proposed EDT facility are described in Section 2.1.6. At the conclusion of EDT operations, and upon the decommissioning and closure of proposed EDT facility, the site would become available for other uses. Closure activities would encompass decontamination and/or removal of all equipment, process systems, structures, or other materials containing or contaminated with mustard agents or other hazardous constituents associated with the operation of the proposed EDT facility. The plans are to clean-close (i.e., remove or decontaminate all hazardous wastes and residues to levels below applicable standards and limits) the facilities and associated supporting equipment.

It is anticipated that the decommissioning and closure activities for the proposed EDT facility would be similar to those for the BGCAPP as specified in the BGCAPP's RCRA permit (BPBG 2007). The BGCAPP's RCRA permit specifies the objective of closure of the BGCAPP as to render the facility "clean" in accordance with KDEP and RCRA criteria and to close the facility with no requirement for post-closure care. All closure activities would be performed in accordance with the requirements of the Closure Plan as specified in Attachment 9 to the RCRA permit (BPBG 2007).

The Closure Plan describes the closure strategy and performance standards, defines the closure activities, describes the general decontamination procedures and techniques, and discusses the management of wastes generated by the closure activities. The schedule for closure of the BGCAPP is expected to take two years. The overarching objective of the Closure Plan is to assure the closure of the BGCAPP (and/or the proposed EDT facility) will be protective of human health and the environment.

The potential environmental impacts of implementing the Closure Plan for either the BGCAPP or the proposed EDT facility would be expected to be similar to those of constructing those respective facilities, with the additional consideration of the management and disposition of the hazardous wastes that would be generated by decommissioning and closure activities. These wastes may require interim storage, further on-site treatment, or shipment to an approved off-site hazardous waste TSDF for further management. Certain hazardous waste management units, equipment, systems, and areas that perform functions essential to protecting human health and the environment will remain operational at the BGAD during the closure activities.

Upon the Army's completion of final closure and acceptance of closure certification by the KDEP, neither the BGCAPP nor the proposed EDT facility would be classified as a hazardous waste TSDF; however, the physical site would remain under the control and custody of the BGAD.

Section 4.25 of the 2002 FEIS described the closure of the BGCAPP upon the completion of its mission to destroy the BGAD inventory of chemical munitions. The 2002 FEIS did not identify any significant adverse impacts that would accompany the decommissioning and closure of the BGCAPP (PMCD 2002). The RCRA permit for the BGCAPP requires the development of a Closure Plan for that facility (BPBG 2007), and the closure requirements for the proposed EDT facility are expected to be similar. Thus, it can be similarly concluded that the decommissioning and closure of the proposed EDT facility would create no significant adverse environmental impacts.

3.2 THE IMPACTS OF THE NO-ACTION ALTERNATIVE

Under the no-action alternative, the site modifications required to support the EDT facility would not be performed, and no EDT facility would be constructed or operated at the BGAD. Therefore, none of the impacts associated with the proposed action as described in Section 3.1 would occur.

The potential environmental impacts associated with the destruction of the entire BGAD inventory of chemical weapons—including the mustard-filled munitions—have been previously assessed in the 2002 FEIS (PMCD 2002). The FEIS concluded that the operation of a chemical weapons destruction facility (such as what is now called the BGCAPP) would not result in any significant adverse environmental impacts; however, the 2002 FEIS did not specifically address potential impacts associated with the destruction of the leaking, overpacked, or other “reject” munitions—or the two mustard-filled DOT bottles—as contemplated by the proposed action in this EA. Furthermore, the 2002 FEIS did not include either a discussion of the potential modifications that would be needed at the BGCAPP in order to process the “rejects” or an assessment of the additional risks associated with the manual processing steps that would accompany these modifications. It is acknowledged that these manual operations, which would be conducted by workers wearing the appropriate PPE, cannot be conducted without any risk; however, the magnitude of this increased risk has not been quantified.

Under the no-action alternative, there would be no changes in land use and no potential for disturbance of cultural (i.e., historic and archaeological) resources. Nor would there be any adverse effects from modifications to or disturbances of existing terrestrial and/or aquatic communities, wetlands, or threatened and endangered species habit areas. Impacts to such resources would therefore not be significant. With the possible exception of an additional washout processing step, there would be no new water consumption requirements (i.e., beyond those already identified and assessed in the 2002 FEIS) for the no-action alternative; however, any washout facility would have the option of recycling the

water back into the washout process. Hence, no significant effects on water resources would be expected.

No significant number of additional workers would be required under the no-action alternative, and no adverse socioeconomic impacts (such as to public services and traffic) would be anticipated; conversely, there would be no beneficial effects derived from any increases in public employment, direct incomes, or tax revenues. No disproportionate impacts to minority or low-income populations would be expected during the processing of the mustard-filled munitions and DOT bottles at the modified BGCAPP.

No significant quantities of additional solid or liquid wastes—beyond those currently anticipated to be generated during the operation of the BGCAPP—would be generated under the no-action alternative. However, some unknown quantities of spent decontamination solutions and expended PPE would be associated with the additional manual processing operations associated with the removal of stuck bursters and/or the washout of solidified heels in the modified BGCAPP.

The interruption of normal BGCAPP operations to implement the additional processing steps required for any encountered stuck bursters and/or solidified heels would increase the overall processing time and would adversely affect the efficiency of BGCAPP operations as measured by throughput rate. The costs and schedule implications of any modifications to the BGCAPP are outside the scope of this EA; nevertheless, such impacts could be significant.

4. CONCLUSIONS

The information and analyses presented in this EA indicate that the proposed action of constructing and operating an EDT facility at the BGAD for the destruction of mustard-agent-filled munitions (i.e., 155mm projectiles) and containers (i.e., DOT bottles) would produce no significant environmental impacts. This finding applies to an EDT facility that incorporates any one of the four types of EDT units evaluated in this EA: the SDC unit, two TDC units, two DAVINCH units, or seven EDS units.

Additional details on the above finding are presented in Section 4.1 for the proposed action. Section 4.2 describes the findings for the no-action alternative, and Section 4.3 presents an overall statement of findings for this EA.

4.1 SUMMARY OF IMPACTS FOR THE PROPOSED ACTION

4.1.1 Land Use

The land use impacts of constructing the proposed EDT facility would be relatively minor (i.e., would involve the use of between 2.5 and 10 acres within the installation boundaries of the 14,596-acre BGAD) and would occur within or adjacent to the footprint of the existing BGCAPP site. The two potential sites shown in Figure 2-9 for the EDT facility have been assessed under NEPA for previous actions, are currently disturbed and in use as BGCAPP construction lay-down areas, and are managed under the BGAD's existing Integrated Natural Resources Management Plan (Stout et al. 2010). Therefore, construction of the proposed EDT facility at either site would have no significant impacts to either on-site or off-site land use. Similarly, the 2013 HHRA for the proposed EDT facility (see Section 3.1.3.1) identified no significant impacts to either on-site or off-site land use as a result of the emissions of the proposed EDT facility over its operational lifetime.

4.1.2 Air Quality

The air quality modeling analysis conducted for this EA shows that an EDT facility with any one of the four EDT systems would produce no significant impacts on the ambient air quality at the BGAD installation boundary during both the construction and the operation of the proposed facility. Air quality impacts within the larger region around the BGAD would be even smaller in magnitude. The percentage contributions to the primary and

secondary NAAQS for all criteria pollutants during the operation of the proposed EDT facility with any of the four EDT systems were modeled and were found not to be significant. Contributions of GHG emissions from the proposed EDT facility in conjunction with the emissions anticipated from the BGCAPP would also be insignificant in comparison to other sources of such emissions within Kentucky, within the United States, and throughout the world.

The impacts to air quality—as measured by the predicted effects on ambient air concentrations of pollutants regulated by the NAAQS—are expected to be minor for an EDT facility that uses any of the four EDT systems. Therefore, no significant impacts to air quality would be expected from implementation of the proposed action.

4.1.3 Surface Water Resources

The water to be used at the proposed EDT facility would be obtained from surface water resources (i.e., Lake Vega) at the BGAD. The anticipated quantity of water needed during the construction of the proposed EDT facility would be small in comparison to the quantity of water needed for similar construction activities at the BGCAPP. The use of water for construction of the proposed EDT facility would therefore not be expected to create any significant impacts to water supplies.

The primary impacts from water use at the proposed EDT facility would be associated with the quantities of process water needed for operation of the facility and non-process water required to support the facility. The combined process water and non-process water requirement of the proposed EDT facility would be only about 1 percent of the current annual water use at the BGAD. Thus, adequate water supplies exist to support the operation of the proposed EDT facility.

In regard to cumulative impacts to surface water resources, the combined water use of the BGCAPP and the proposed EDT facility would be about 5 percent of the existing capacity of the BGAD's water treatment plant. If the existing BGAD water use were to continue while both the BGCAPP and the proposed EDT facility were in simultaneous operation, the combined total consumption of all water used at the BGAD would be about 33 percent of the existing capacity of the BGAD's water treatment plant, and would be equivalent to only about 17 percent of the normal pool capacity of Lake Vega.

Thus, adequate water supplies exist to support the operation of both the BGCAPP and the proposed EDT facility if they were to be in operation simultaneously. Because the BGCAPP and the proposed EDT facility are each expected to be in operation for less than five years, any overall impacts to water supplies would therefore be temporary and minor, if observable at all.

Based on the above considerations, it is concluded that no significant impacts to surface water resources would occur during either the construction or the operation of the proposed EDT facility.

4.1.4 Groundwater Resources

None of the water used at the BGAD originates from groundwater sources. No groundwater would be consumed, diverted, or affected by the proposed action. Therefore, no significant impacts to groundwater resources would occur as a result of the proposed action.

4.1.5 Human Health and Safety

An HHRA was prepared for the emissions from the proposed EDT facility, and the emissions from each type of EDT unit were examined separately (Franklin 2012, 2013). Three measures of risk [i.e., the excess individual lifetime cancer risk, the chronic (long-term) non-carcinogenic risk, and the acute inhalation hazard] were included in the HHRA. The 2013 HHRA for the proposed EDT facility was patterned after the 2011 SLHHRA for the BGCAPP. For each type of EDT unit and for each hypothetical exposure scenario, the cumulative risks of each type of EDT unit in combination with the risks of the BGCAPP were evaluated. These risks were expressed as a simple arithmetic sum even though the location of the hypothetical maximum exposed receptor may not be the same for the BGCAPP as for the proposed EDT facility.

For the excess individual lifetime cancer risk, the adult farmer scenario produced the largest numerical risk values for each type of EDT unit operating in combination with the BGCAPP. The results indicate that the contribution of each type of EDT unit to the overall combined cancer risk is about 0.8 percent for the SDC, about 18 percent for the TDC, about 15 percent for the DAVINCH, and about 0.4 percent for the EDS. The results also show that any of the four EDT systems operating in combination with the BGCAPP would produce numerical values for the excess individual lifetime cancer risks that are acceptable to the KDEP. That is, the risk from the BGCAPP emissions in combination with the risk from the emissions from any of the four types of EDT units is between about 45 and 55 times lower than the acceptable level of 1×10^{-5} .

For the chronic non-carcinogenic risk (expressed as an HI value), the exposure scenario for the child of the farmer produced the largest numerical HI values for each type of EDT unit operating in combination with the BGCAPP. The contribution of each type of EDT unit to the overall combined non-cancer HI value is about 0.1 percent for the SDC, about 9 percent for the TDC, about 7 percent for the DAVINCH, and about 0.1 percent for the EDS. The results also show that any of the four EDT systems operating in combination with the

BGCAPP would produce numerical values for the chronic non-cancer risks (expressed as HI values) that are acceptable to the KDEP. That is, the HI value for the BGCAPP emissions in combination with the HI value for any of the four types of EDT units is between about 18 and 20 times lower than the acceptable level of 0.25.

For the acute inhalation hazard (expressed as an HI value), the contribution of each type of EDT unit to the overall combined acute HI value for the proposed EDT facility in combination with the BGCAPP is about 1.5 percent for the SDC, about 3 percent for the TDC, about 1 percent for the DAVINCH, and about 0.05 percent for the EDS. The results also show that any of the four EDT systems operating in combination with the BGCAPP would produce acute HI values acceptable to the KDEP. That is, the acute HI value for the BGCAPP in combination with the acute HI value for any of the four types of EDT units is about 10 times lower than the acceptable level of 0.25.

Based on the above findings from 2013 HHRA for the proposed EDT facility, the emissions from any of the four EDT systems (i.e., either the one SDC, the two TDC units, the two DAVINCH units, or the seven EDS units) would satisfy the acceptable levels of risk as established by the KDEP. Furthermore, the combined risks of the proposed EDT facility and those of the BGCAPP would also fall beneath all of the risk thresholds that are acceptable to the KDEP. Both the predicted air concentration values and the predicted deposition rates indicate that any impacts to nearby farmlands or agricultural activities would not be significant.

No specific worker exposure scenarios were developed in the 2013 HHRA for the proposed EDT facility; however, the contributions of the inhalation exposure pathway were separately calculated for both the excess individual lifetime cancer risk and the chronic non-carcinogenic risk. These two measures of risk can be used as surrogates for an individual who works at the BGAD. The findings of the 2013 HHRA indicate that no significant impacts to such workers would be expected. The hazards of mustard agent are well documented, and the Army has developed and implemented engineering barriers (such as filtered ventilation systems and protective clothing), procedures, and administrative controls to deal appropriately with these hazards. Potential accidents and exposures that could occur at the proposed EDT facility would be addressed and mitigated via hazard analysis and risk reduction as required by Army Regulation 385-10. Concerns with respect to location, siting, and exposures to and from adjacent facilities (e.g., from the proposed EDT facility to the BGCAPP, and vice versa) would be addressed by AR 385-10 and via submittal of an Explosive Safety Site Plan for the EDT facility to the Department of Defense Explosive Safety Board. No significant human health impacts would be expected to occur to on-site workers during the operation of the proposed EDT facility.

4.1.6 Aquatic Ecological Resources and Wetlands

No aquatic resources or wetlands would be disturbed or affected by the proposed action. The closest such area is approximately 1500 ft east of the alternate site for the proposed EDT facility (i.e., a facility using multiple EDS units). Implementation of best management practices for erosion and siltation control during construction would prevent any significant impacts to aquatic resources or habitats, or to wetlands, as a result of the proposed action.

4.1.7 Terrestrial Ecological Resources

The anticipated impacts to terrestrial resources, including vegetation and wildlife, during the construction of the proposed EDT facility would be expected to be negligible. The potential for impacts to federally- and State-listed threatened, endangered, and special concern species during the construction of the proposed EDT facility using any of the three EDT systems at the proposed site or using the multiple EDS units at the alternate site is also considered to be negligible, primarily due to the absence of such species or viable habitat within the proposed construction area. Any required removal of potential Indiana bat roost trees present on the proposed site would be limited to the winter months (October 15 to March 31) in order to avoid any potential impacts to roosting bats.

A SLERA was previously conducted as part of the 2002 ACWA EIS, and it assessed potential risks to ecological resources for each of four ACWA technologies that were being considered for pilot testing at BGAD, including the selected chemical neutralization/SCWO technology (ACWA 2002). In the 2013 HHRA for the proposed EDT facility, the cumulative risks using any of the four EDT systems were found to be lower by at least one order of magnitude than the risk levels of concern to the KDEP. The proposed EDT facility by itself would contribute up to about 20 percent of the overall levels of risk that were discussed and analyzed in detail in the 2011 SLHHRA for the BGCAPP. Although no SLERA has been conducted for the proposed EDT facility, the addition of up to 20 percent to the ecological risk assessed in the 2002 SLERA would be of little practical consequence. It is concluded that routine emissions from the proposed EDT facility over its operational lifetime—using any of the four EDT systems under consideration in this EA—would create negligible impacts on terrestrial resources.

4.1.8 Socioeconomic Resources

The construction and operation of the proposed EDT facility would be much smaller actions than the corresponding activities at the BGCAPP that were previously assessed in

the 2002 FEIS; hence, the finding of no significant impact to socioeconomic resources in the 2002 FEIS would also be applicable to the proposed EDT facility. The specific findings from the analyses conducted in this EA are discussed in the following subsections.

4.1.8.1 Employment

Operation of the proposed EDT facility would require a larger workforce (up to 210 workers) than construction (up to 50 workers), but the construction workers would be on site longer (27 months) than the operations workers (38 weeks). It is possible that some of the construction workers, and most of the operations workers, would in-migrate from outside the region. The construction and operations jobs could help the local economy in terms of reducing unemployment, producing direct incomes, contributing to indirect jobs and incomes, and increasing purchases and tax revenues, but the overall beneficial impact is still likely to be minor and relatively short-term in the context of the regional economy.

4.1.8.2 Housing

The construction and operation of the proposed EDT facility would not create significant population growth in Madison County and, therefore, would not generate significant additional demand for housing. Madison County's 2010 *Comprehensive Plan* concludes that the county has an adequate supply of vacant housing units and developable land to accommodate projected population growth through 2025. EDT-related population growth could add up to 210 new households to Madison County, but this number of additional housing units would represent only 5 percent of Madison County's existing vacant housing units. Thus, construction and operation of the proposed EDT facility is not likely to have a significant impact on the availability or cost of housing in Madison County.

4.1.8.3 Public services

The construction and operation of the proposed EDT facility would not create significant population growth or demand for housing in Madison County and, therefore, would not generate significant additional demand for public services including water supplies, wastewater management, solid waste disposal, and schools. EDT facility construction and operation would contribute to existing traffic congestion on KY 52, especially during the morning and afternoon traffic peaks, but the impact would not be significant, especially if BGAD implements measures to help avoid impacts (e.g., staggered shift changes, carpooling, etc.).

4.1.9 Aesthetics

The physical layout of the proposed EDT facility would resemble that of any small-scale industrial facility, and structures at the proposed EDT facility would blend in with the other structures being constructed at the BGCAPP regardless of which of the two sites in Figure 2-9 were chosen. For the site of the EDT facility that uses the SDC, the TDC, or the DAVINCH systems, the nearest installation boundary is approximately 1.6 miles away. For the alternate site of the EDT facility that uses the EDS system, the nearest installation boundary is approximately 1.3 miles away. The presence of the EDT facility at either site would not be expected to adversely affect viewsheds or the aesthetic characteristics of the area in which the BGCAPP is already located. Therefore, no significant impacts to aesthetic resources would occur as a result of the proposed action.

4.1.10 Cultural Resources

Cultural resources within the BGAD boundaries are managed under the BGAD's existing Integrated Cultural Resources Management Plan (BAI 2008). Because the proposed action would occur within one of two existing, previously disturbed sites that are currently used as lay-down areas for BGCAPP construction activities, no potential exists for the proposed action to disturb or affect cultural resources. Therefore, no significant impacts to cultural resources would occur at either site as a result of the proposed action.

4.1.11 Environmental Justice

The most recent data from the U.S. Census Bureau indicate that some Madison County census tracts near the BGAD contain populations that represent minority and/or low-income populations. Therefore, an analysis was conducted in this EA to determine whether those populations would suffer any "disproportionately high and adverse human health or environmental effects" from the proposed action.

In terms of human health effects, the 2013 HHRA for the proposed EDT facility identified no significant health effects for any population from the emissions of the proposed EDT facility over its operational lifetime. Further, the health risk assessment uses a pair of scenarios (namely, the farmer and the fisher) that may be representative of the subsistence lifestyles of some minority or low-income populations around the BGAD. The 2013 HHRA found no health risk concerns for such individuals. Therefore, the minority and low-income populations identified near the BGAD would not suffer any disproportionately high and adverse human health effects from the proposed action.

Similarly, the analyses of potential impacts to resource categories other than human health concluded that there would be no significant impacts to such resources—including air quality, water, ecological resources, and socioeconomic resources—from constructing or operating the proposed EDT facility. Therefore, the minority and low-income populations identified near the BGAD would not suffer any disproportionately high and adverse environmental effects from the proposed action.

4.1.12 Noise

The noise anticipated from the construction and operation of the proposed EDT facility was compared to the EPA guidelines regarding noise levels protective of public health and welfare. Anticipated noise levels at the BGAD boundary nearest to the site of the proposed EDT facility were estimated through the use of equations for the propagation of sounds. The equations indicate that the construction noise level at the nearest BGAD boundary would be well below the threshold at which activity interference or annoyance would occur. The predicted noise level would be approximately the same as background noise level at that location. Thus, noise impacts from construction activities at the proposed EDT facility are expected to be minimal at the nearest BGAD boundary.

The equations for the propagation of sound were also used to estimate the noise levels at the nearest BGAD boundary during the operation of an EDT facility using each type of EDT unit. The predicted noise levels in each case were found to be below the EPA-recommended thresholds of concern. In regard to cumulative impacts of the operational noise from the proposed EDT facility in combination with other noise sources, such as the operation of the BGCAPP, the analysis conducted in the 2002 FEIS (PMCD 2002) indicated that anticipated noise at the nearest BGAD boundary due to the operations of the BGCAPP would be below the threshold levels of concern. Sound pressure levels from several noise sources are not additive; nevertheless, equations used to estimate the superposition of one sound level upon another indicate that the corresponding increase in the greatest noise level (i.e., for the EDS system) at the nearest BGAD boundary would nevertheless be below the EPA-recommended threshold at which activity interference or annoyance would occur. The sound levels predicted during the operation of the proposed EDT facility in conjunction with other nearby noise sources are thus expected to be within the recommended EPA guidelines at the nearest BGAD boundary. Therefore, no significant impacts from noise would be expected during the proposed action.

4.1.13 Waste Management

The construction and operation of an EDT facility using any of the four EDT systems would generate both solid and liquid non-hazardous waste, as well as small amounts of potentially hazardous solid and liquid waste. In regard to construction wastes, the quantities of waste from construction of the proposed EDT facility would be much smaller than those associated with BGCAPP construction because of the relative sizes of the two facilities. No significant quantities of waste would be generated by the construction of the proposed EDT facility, and no significant impacts from such construction wastes would be expected to occur.

The wastes to be generated during the operation of the proposed EDT facility vary by the type of EDT unit that would be deployed. The quantities of both the solid waste and the liquid waste from the proposed EDT facility are analyzed in this EA.

The largest quantity of solid waste among the four types of EDT units would be generated by the use of the two TDC units. This quantity of waste would represent a 15 percent increase in the quantity of solid waste to be generated by the BGCAPP; however, the combined total amount of solid waste from the proposed EDT facility, the BGCAPP, and other activities at the BGAD—if these solid wastes were to be classified as hazardous wastes—would represent an increase of only about 1 percent in the total quantity of hazardous waste managed by landfill/surface impoundment in Kentucky and the surrounding seven states during 2011 (the latest year for which such statistics are available). This small increase would not create a significant impact to regional hazardous waste management capabilities for solid waste.

For the purpose of analysis in this EA, all of the process water used by the two DAVINCH units and the seven EDS units was assumed to become liquid hazardous waste. Note that the SDC unit and the two TDC units do not generate any liquid wastes. The largest quantity of liquid waste among these types of EDT units would be generated by the multiple EDS units. This quantity of waste would represent a 6 percent increase in the quantity of liquid waste to be generated by the BGCAPP. The combined total amount of liquid waste from the proposed EDT facility, the BGCAPP, and other activities at the BGAD (if these liquid wastes were to be classified as hazardous wastes)—in combination with the aforementioned cumulative solid waste—would represent an increase of about 19 percent in the quantity of hazardous waste managed by landfill/surface impoundment in Kentucky and the surrounding seven states, even though these liquid wastes might not be suitable for disposal by such methods. In regard to other methods of disposal, the cumulative quantity of liquid waste from the proposed EDT facility, the BGCAPP, and other activities at the BGAD would represent an increase of only about 1.5 percent in the quantity of hazardous waste disposed of in 2011 by deep well injection in Kentucky and the surrounding seven states.

This small increase would not be expected to create any significant impacts to regional waste management capabilities for liquid hazardous waste.

Based on the analyses in this EA, adequate waste management capacity exists at TSDFs within Kentucky and the surrounding seven states to accommodate the quantities of solid and liquid waste anticipated from operation of the proposed EDT facility. Therefore, no adverse impacts from the management of such solid or liquid wastes would be expected to occur as a result of the proposed action.

4.1.14 Transportation of Waste

The waste quantities from Section 3.1.8.2 were subjected to an evaluation of potential impacts during transportation of those wastes to off-site TSDFs. The number of trips was estimated for both solid and liquid wastes, and this number included the combined wastes anticipated to be generated by the BGCAPP, the proposed EDT facility, and other activities at the BGAD over a 3-year period (i.e., the assumed lifetime of the BGCAPP). Crash statistics for large trucks—as maintained in the DOT's Fatality Analysis and Reporting System (FARS) (FMCSA 2012a)—were used as the basis for the accident analysis in this EA.

The FARS statistics, as used in this EA, indicate that no significant number of accidents would be expected to occur during the number of off-site waste shipments associated with the operational lifetime of the proposed EDT facility in combination with the lifetime number of waste shipments from the BGCAPP. That is, the number of anticipated accidents of all types would be small (i.e., less than eight) during the shipment of all such waste from the BGAD. Statistically, far less than one of these accidents would be expected to result in fatalities, and less than two of these accidents would be expected to result in injuries.

The FARS statistics, as used in this EA, indicate that no significant number of injuries or fatalities would be expected to occur during the off-site shipment of wastes from the BGAD over the lifetime of the proposed EDT facility, even when the shipments of wastes from the BGCAPP and other activities at the BGAD are included. For the assumed one-way transportation distances to be traveled by the BGAD wastes, the number of statistically anticipated injuries would be less than three during the operational lifetimes of the proposed EDT facility and the BGCAPP. The total number of fatalities expected from accidents involving off-site waste shipments during this period would statistically be much, much less than 1.

The risk of transportation accidents during the off-site shipment of waste from the proposed EDT facility was thus found not to be significant. Furthermore, the consequences of any such accidents were statistically evaluated and were also found not to be significant. Because (1) nationwide, there are millions of highway shipments of hazardous materials

each year, for which the states already provide capable emergency response, and (2) some of these shipments involve chemicals (such as sulfuric acid) that present far more toxic hazards than the wastes to be shipped from the BGAD, it is concluded that the Army's intent to ship wastes from the BGAD to permitted TSDFs does not pose any unique safety concerns or unacceptable environmental impacts relative to those associated with routine commercial and trade industry hazardous waste shipments.

Based on the transportation analyses conducted in this EA, no significant number of accidents would be expected to occur during the off-site shipment of waste from the proposed EDT facility, nor would there be any significant consequences if such accidents were to actually occur.

4.1.15 Resource Requirements

Operation of the proposed EDT facility would require the consumption of electricity, natural gas, diesel fuel and/or fuel oil, water, and reagent chemicals for some types of EDT units and/or their off-gas treatment systems. The numerical quantities that would be required for each of these resources have been evaluated against the resource requirements for the BGCAPP on an annual basis. The 2002 FEIS found no significant impacts associated with the projected resource consumption requirements of the BGCAPP.

The quantities of electricity, natural gas, diesel fuel and/or fuel oil, and reagent chemicals that are required for the operation of the proposed EDT facility would be small in comparison to the quantities of the resources to be used during BGCAPP operations, and none of these commodities is in short supply. For the above reasons, the potential impacts to the resources required to operate the proposed EDT facility would not be expected to be significant.

4.1.16 Decommissioning and Closure

At the conclusion of EDT operations, and upon the decommissioning and closure of proposed EDT facility, the site would become available for other uses. Closure activities would encompass decontamination and/or removal of all equipment, process systems, structures, or other materials containing or contaminated with mustard agents or other hazardous constituents associated with the operation of the proposed EDT facility. The plans are to clean-close (i.e., remove or decontaminate all hazardous wastes and residues to levels below applicable standards and limits) the facilities and associated supporting equipment. Upon the Army's completion of final closure and acceptance of closure certification by the KDEP, neither the BGCAPP nor the proposed EDT facility would be classified as a

hazardous waste TSDF; however, the physical site would remain under the control and custody of the BGAD.

The 2002 FEIS described the closure of the BGCAPP upon the completion of its mission to destroy the BGAD inventory of chemical munitions. The 2002 FEIS did not identify any significant adverse impacts that would accompany the decommissioning and closure of the BGCAPP (PMCD 2002). The RCRA permit for the BGCAPP requires the development of a Closure Plan for that facility (BPBG 2007), and the closure requirements for the proposed EDT facility are expected to be similar. Thus, it can be similarly concluded that the decommissioning and closure of the proposed EDT facility would create no significant adverse environmental impacts.

4.2 SUMMARY OF IMPACTS FOR THE NO-ACTION ALTERNATIVE

The no-action alternative involves the use of the BGCAPP to destroy the BGAD inventory of mustard-filled 155mm projectiles and DOT bottles, even though the current BGCAPP design would not be able to handle the anticipated problems with stuck bursters and/or solidified mustard agent. Under the no-action alternative, certain modifications would need to be made to the BGCAPP in order to accommodate the processing of the problematic mustard-filled 155mm projectiles.

Under the no-action alternative, the site modifications required to support the EDT facility would not be performed, and no EDT facility would be constructed or operated at the BGAD. Therefore, none of the environmental impacts associated with the proposed action would occur.

The potential environmental impacts associated with the destruction of the entire BGAD inventory of chemical weapons—including the mustard-filled munitions—have been previously addressed in the 2002 FEIS (PMCD 2002). The FEIS concluded that the operation of a chemical weapons destruction facility (such as what is now called the BGCAPP) would not result in any significant adverse environmental impacts; however, the 2002 FEIS did not specifically address potential impacts associated with the destruction of the leaking, overpacked, or other “reject” munitions—or the two mustard-filled DOT bottles—as contemplated under the proposed action in this EA. Furthermore, the 2002 FEIS did not include either a discussion of the potential modifications that would be needed at the BGCAPP in order to process the “rejects” or an assessment of the additional risks associated with the manual processing steps that would accompany these modifications. It is acknowledged that these manual operations, which would be conducted by workers wearing the appropriate PPE, cannot be conducted without any risk; however, the magnitude of this increased risk has not been quantified.

Under the no-action alternative, there would be no changes in land use and no potential for disturbance of cultural (i.e., historic and archaeological) resources. Nor would there be any adverse effects from modifications to or disturbances of existing terrestrial and/or aquatic communities, wetlands, or threatened and endangered species habit areas. Impacts to such resources would therefore not be significant. With the possible exception of an additional washout processing step, there would be no new water consumption requirements (i.e., beyond those already identified and assessed in the 2002 FEIS) for the no-action alternative; however, any washout facility would have the option of recycling the water back into the washout process. Hence, no significant effects on water resources would be expected.

No significant number of additional workers would be required under the no-action alternative, and no adverse socioeconomic impacts (such as to public services and traffic) would be anticipated; conversely, there would be no beneficial effects derived from any increases in public employment, direct incomes, or tax revenues. No disproportionate impacts to minority or low-income populations would be expected during the processing of the mustard-filled munitions and DOT bottles at the modified BGCAPP.

No significant quantities of additional solid or liquid wastes—beyond those currently anticipated to be generated during the operation of the BGCAPP—would be generated under the no-action alternative. However, some unknown quantities of spent decontamination solutions and expended PPE would be associated with the additional manual processing operations associated with the removal of stuck bursters and/or the solidified heels in the modified BGCAPP.

The interruption of normal BGCAPP operations to implement the additional processing steps required for any encountered stuck bursters and/or solidified heels would increase the overall processing time and would adversely affect the efficiency of BGCAPP operations as measured by throughput rate. The costs and schedule implications of any modifications to the BGCAPP are outside the scope of this EA; nevertheless, such impacts could be significant.

It should be noted that the implementation of the proposed EDT facility (i.e., the proposed action) to process the entire BGAD inventory of mustard-filled 155mm projectiles and DOT bottles would completely eliminate the need for a design modification to the BGCAPP to handle any mustard-filled munitions and would also completely eliminate the need for any mustard campaign whatsoever at the BGCAPP (because the 155mm projectiles and DOT bottles contain the total inventory of mustard agent at the BGAD). Under the proposed action, the mission of the BGCAPP could therefore focus solely on the campaigns to destroy two chemical warfare agents (i.e., the nerve agents GB and VX) instead of three.

4.3 OVERALL FINDING AND CONCLUSION

Based on the above considerations and the lack of significant adverse environmental effects, it is concluded that the most desirable course of action would be to proceed with the construction of an EDT facility that incorporates any one of the four types of EDT units (i.e., the SDC, the TDC, the DAVINCH, or the EDS) and to operate this new EDT facility so as to complete the destruction of the problematic mustard-filled munitions and DOT bottles currently stored at the BGAD.

As described in detail above in this section, the proposed action evaluated in this EA would create no significant impacts. This finding applies to the construction, operation, and decommissioning/closure of an EDT facility using any one of the commercial types of EDT systems (i.e., the SDC, the TDC, or the DAVINCH) at the proposed location at the southwest corner of the BGCAPP footprint or using the U.S. Army-owned EDS located at the alternate site just to the north of the BGCAPP.

A draft finding of no significant impact (FONSI) indicating the above conclusion has been prepared and will be issued for public review and comment simultaneous with the public review period for this Final EA.

5. PERSONS CONTACTED AND CONSULTED

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APPENDIX A

SUMMARY OF EXPLOSIVE DESTRUCTION TECHNOLOGY EQUIPMENT AND EMISSION PARAMETERS, AND EMITTED CHEMICALS OF POTENTIAL CONCERN

The data that served as the basis for the analyses contained in this Environmental Assessment (EA) are shown in Table A-1. These same data were also used in the human health risk assessment (HHRA) that was prepared on the emissions anticipated from the explosive destruction technology (EDT) facility proposed at the Blue Grass Army Depot (BGAD) in Kentucky (Franklin 2012, 2013).

The chemicals of potential concern (COPCs) that were included in the HHRA are listed in Table A-2. COPCs are those chemicals that have been identified as potentially being emitted from one or more of the four types of EDT systems, as follows. In July 2010, interested vendors responded to a request for proposal (RFP) to construct an EDT system at the Pueblo Chemical Depot in Colorado. As part of the RFP, vendors were requested to provide short-term emission rates for all pollutants known to be emitted from their systems. The list of the various COPCs emitted by each type of EDT system differs among the systems for several reasons, including:

- Type of technology,
- Type of process materials used (e.g., donor charges, neutralization agent, purge gases),
- Process conditions (e.g., temperature, pressure, residence time),
- Munitions feed rate, and
- Pollution abatement and off-gas treatment system employed.

The list of COPCs also differed among the types of EDT systems due to other test conditions under which those COPCs were identified. For example, the testing for the Transportable Detonation Chamber (TDC) was conducted using mustard-filled British munitions; however, this type of munition will not be processed in the proposed EDT facility at the Blue Grass Army Depot.

The COPC-specific emission rates that were used in the development of the HHRA for the proposed Blue Grass EDT facility are presented in a report by ERM Consulting Services (ERM 2013); however, the emissions rates are not repeated in this appendix due to the large volume of those data.

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Table A-1. EDT Equipment and Emission Parameter Summary.

	SDC	TDC	DAVINCH	EDS
Type of process	thermal destruction	“cold” destruction (uses donor explosive)	“cold” destruction (uses donor explosive)	“cold” destruction (uses donor explosive)
Number of EDT units for proposed Blue Grass EDT facility	1	2	2	7
Operating schedule	24 hr/day, 7 day/week	24 hr/day, 7 day/week	24 hr/day, 7 day/week	24 hr/day, 6 day/week
Number of items in Blue Grass Army Depot stockpile to be processed:				
155mm projectile, filled with H agent (mustard)	15,492	15,492	15,492	15,492
Overpacked munition/leaker; 155mm projectile, filled with H agent (mustard)	approximately 200	approximately 200	approximately 200	approximately 200
DOT 3A Transportation Bottle containing H agent (mustard)	2	2	2	2
Exhaust configuration:				
	<p>The SDC system is operated inside an environmental enclosure.</p> <ul style="list-style-type: none"> • One stack for process exhaust [after the off-gas treatment system (OTS)] • One stack for air from the environmental enclosure • Each stack has its own agent monitor 	<p>Each TDC system is operated inside an environmental enclosure.</p> <ul style="list-style-type: none"> • Exhaust from the TDC OTS is discharged into the system enclosure • Enclosure air is then discharged through a pair of identical building air filtration systems and stacks • Each stack has its own agent monitor 	<p>Each DAVINCH system is operated inside an environmental enclosure.</p> <ul style="list-style-type: none"> • Exhaust from OTS is combined with building ventilation air from the environmental enclosure and discharged through a single stack • The stack has an agent monitor 	<p>Each EDS unit is operated inside an environmental enclosure.</p> <ul style="list-style-type: none"> • Emissions from the filter system are combined with enclosure air prior to passing through an air filtration unit and exiting the stack • The stack has an agent monitor

Table A-1. (continued)

	SDC	TDC	DAVINCH	EDS
NAAQS criteria pollutants emitted:				
PM ₁₀	yes	yes	yes	yes
PM _{2.5}	yes	yes	yes	yes
SO ₂	yes	yes	yes	yes
CO	yes	yes	no (none expected)	no (none expected)
NO ₂	yes	yes	yes	yes
Ozone	no (not modeled)	no (not modeled)	no (not modeled)	no (not modeled)
Lead (Pb)	yes	yes	yes	yes
Basis for criteria pollutant emission rates:				
Stockpile munitions and overpacked munitions/leakers	Emission rates were provided by the vendor based on testing performed at the Anniston Chemical Agent Disposal Facility (ANCDF) using agent with the OTS in full operation.	Emission rates were provided by the vendor based on testing performed at Porton Down, UK, using mustard-filled munitions with the OTS in operation.	Emission rates were provided by the vendor based on testing performed at Kanda Port, Japan, and Poelkapelle, Belgium, with the OTS in operation. Vendor stated that no carbon monoxide emissions would be expected.	Emission rates were provided by the Army based on templates developed for Resource Conservation and Recovery Act (RCRA) permit applications at Dugway Proving Ground and Deseret Chemical Depot and the Clean Air Act Notice of Intent for Deseret Chemical Depot. All emissions originate from EDS neutralent and rinsate wastes drained from the EDS vessel into the Waste Transfer System (WTS). Gases expelled from the WTS exit through a canister filter. The neutralent chemical reactions would eliminate any carbon monoxide emissions.
Categories of COPCs emitted (see detailed list of COPCs in Table A-2):				
organics	yes	yes	yes	yes
PCDDs	no (measured non-detect)	yes	no (measured non-detect)	no
PCDFs	yes	yes	no (measured non-detect)	no
PCBs	no (measured non-detect)	no (measured non-detect)	yes	no
inorganics	yes	yes	yes	yes

Table A-1. (continued)

	SDC	TDC	DAVINCH	EDS
Basis for COPC emission rates:				
Stockpile munitions and overpacked munitions/leakers; During testing	<p>Provided by the vendor based on testing performed at the ANCDF using agent with the OTS in full operation.</p> <p>The OTS during testing consisted of:</p> <ul style="list-style-type: none"> • Thermal oxidizer • Quench system • Baghouse filter • Acid and neutral scrubbers • Chem demil filter bank consisting of a HEPA filter followed by a Sulfur Impregnated activated Carbon (SIC) filter followed by an activated carbon (AC) filter and a final HEPA filter 	<p>Provided by the vendor based on testing performed at Porton Down, UK using 25-pdr mustard-filled munitions.</p> <p>The following OTS was in use during the testing:</p> <ul style="list-style-type: none"> • Alkali feed which removes approx. 99.5 % of acid gases • Particulate filter which removes approx. 99.9 % of all particles by weight • Catalytic oxidizer - removes approx. 99 % of carbon monoxide and residual organics • Dual bed carbon filters which remove approx. 99 % of residual organics • HEPA filter which removes approx. 99.97 % of residual particles by weight 	<p>Provided by vendor based on testing performed at the Kanda Port, Japan and Poelkapelle, Belgium and include the following:</p> <ul style="list-style-type: none"> • Hydrogen chloride; measurements at Belgium; maximum value used for emission rate • Dioxins and furans; measurements at Japan; maximum value used for emission rate • Copper; assumed 1 % of copper within the detonator enters the OTS, where 99 % is removed by scrubber and 99.9 % by filter • Lead; assumed 1 % of lead within the detonator enters the OTS, where 99 % is removed by scrubber and 99.9 % by filter • Mercury; assumed 0.7 % of mercury within the detonator enters the OTS, where 99 % is removed by scrubber, 99.9 % by filter, and 99.9 % by SIC <p>The OTS consists of:</p> <ul style="list-style-type: none"> • Off-gas pre-filter and filter • Plasma oxidizer • Scrubber • Charcoal filter/cyclone 	<p>Emission rates were estimated using templates developed for Resource Conservation and Recovery Act (RCRA) permit applications at Dugway Proving Ground and Deseret Chemical Depot and the Clean Air Act Notice of Intent for Deseret Chemical Depot.</p> <p>EDS neutralant and rinsate wastes are drained from the EDS vessel into the Waste Transfer System (WTS). Gases expelled from the WTS exit through duct work that connects the EDS WTS to the Air Filtration Unit (AFU) that services the environmental enclosure surrounding the EDS workspace. The WTS exhaust duct includes a canister filter that contains silica gel and activated carbon. The canister filter is replaced with each batch of munitions processed.</p>
Stockpile munitions and overpacked munitions/leakers; During operation	Same as above	Same as above	Same as above	Same as above

Table A-2. Chemicals of Potential Concern (COPCs).

COPC	CAS Number	Chemical Grouping	Emission Source			COPC			
			EDT Only	BGCAPP Only	Both EDT and BGCAPP	SDC	TDC	DAVINCH	EDS
1,1,1-trichloroethane	71-55-6	Organic			✓	✓			
1,1-dichloroethane	75-34-3	Organic			✓	✓			
1,2-dichloroethane	107-06-2	Organic			✓	✓			
1,1-dichloroethene	75-35-4	Organic			✓	✓			
1,2-dichloropropane	78-87-5	Organic	✓			✓			
1,3-butadiene	106-99-0	Organic	✓			✓			
1,4-dioxane	123-91-1	Organic	✓				✓		
2-butanone	78-93-3	Organic	✓			✓	✓		
acetone	67-64-1	Organic			✓	✓	✓		✓
benzene	71-43-2	Organic			✓	✓	✓		✓
benzo-a-pyrene	50-32-8	Organic		✓					
benzoic acid	65-85-0	Organic	✓			✓			
benzyl alcohol	100-51-6	Organic	✓			✓			
bis(2-ethylhexyl)-phthalate	117-81-7	Organic	✓			✓	✓		✓
bromodichloromethane	75-27-4	Organic	✓			✓			
bromomethane	74-83-9	Organic	✓			✓			
butanal	123-72-8	Organic		✓					
carbon disulfide	75-15-0	Organic	✓			✓			✓
carbon tetrachloride	56-23-5	Organic	✓			✓			
chlorobenzene	108-90-7	Organic	✓			✓			
chloroethane	75-00-3	Organic		✓					
chloroform	67-66-3	Organic			✓	✓			
chloromethane	74-87-3	Organic			✓	✓	✓		
cis-1,2-dichloroethene	159-59-2	Organic		✓					
cis-1,3-dichloropropene	10061-01-5	Organic	✓			✓			
cyclohexanone	198-94-1	Organic		✓					
dibromochloromethane	124-48-1	Organic	✓			✓			
dichlorodifluoromethane	75-71-8	Organic	✓			✓	✓		
di-n-butyl phthalate	84-74-2	Organic	✓			✓	✓		
di-n-octyl phthalate	117-84-0	Organic	✓				✓		

Table A-2. (continued)

COPC	CAS Number	Chemical Grouping	Emission Source			COPC			
			EDT Only	BGCAPP Only	Both EDT and BGCAPP	SDC	TDC	DAVINCH	EDS
ethane	74-84-0	Organic	✓				✓		
ethanol	64-17-5	Organic	✓						✓
ethylbenzene	100-41-4	Organic	✓			✓			
formaldehyde	50-00-0	Organic		✓					
Freon 113	76-13-1	Organic	✓			✓			
hexane	110-54-3	Organic	✓			✓			
isopropyl alcohol	67-63-0	Organic		✓					
methane	74-82-8	Organic	✓				✓		✓
methyl chloride	74-87-3	Organic		✓					
methylene chloride	75-09-2	Organic			✓	✓			✓
naphthalene	91-20-3	Organic			✓		✓		
perylene	198-55-0	Organic		✓					
phenanthrene	85-01-8	Organic		✓					
RDX (cyclotrimethylenetrinitramine)	121-82-4	Organic		✓					
styrene	100-42-5	Organic	✓			✓			
tetrachloroethene	127-18-4	Organic	✓			✓			
toluene	108-88-3	Organic			✓	✓	✓		✓
trans-1,2-dichloroethene	540-59-0	Organic		✓					
trans-1,3-dichloropropene	10061-02-6	Organic	✓			✓			
trichloroethene	79-01-6	Organic	✓			✓			
trichlorofluoromethane	75-69-4	Organic	✓			✓	✓		
TNT (trinitrotoluene)	118-86-7	Organic		✓					
vinyl chloride	75-01-4	Organic	✓			✓		✓	✓
xylene	1330-20-7	Organic	✓			✓		✓	
m-xylene	108-38-3	Organic		✓					
o-xylene	95-47-6	Organic		✓					
p-xylene	106-42-3	Organic		✓					
GB (sarin)	107-44-8	GB		✓					
H (mustard agent)	505-60-2	H			✓	✓	✓	✓	✓
VX	50782-69-9	VX		✓					

Table A-2. (continued)

COPC	CAS Number	Chemical Grouping	Emission Source			COPC			
			EDT Only	BGCAPP Only	Both EDT and BGCAPP	SDC	TDC	DAVINCH	EDS
aro-chlor-1254	11097-69-1	PCDDs, PCDFs, PCBs		✓					
1,2,3,4,6,7,8-HpCDD	35822-46-9	PCDDs, PCDFs, PCBs			✓		✓		
1,2,3,4,6,7,8,9-OCDD	3268-87-9	PCDDs, PCDFs, PCBs			✓		✓		
1,2,3,4,7,8-HeCDD	39227-28-6	PCDDs, PCDFs, PCBs		✓					
1,2,3,6,7,8-HeCDD	57653-85-7	PCDDs, PCDFs, PCBs		✓					
1,2,3,7,8-PeCDD	40321-76-4	PCDDs, PCDFs, PCBs		✓					
1,2,3,7,8,9-HeCDD	19408-74-3	PCDDs, PCDFs, PCBs		✓					
2,3,7,8-TCDD	1746-01-6	PCDDs, PCDFs, PCBs		✓					
1,2,3,7,8-PeCDF	57117-41-6	PCDDs, PCDFs, PCBs		✓					
1,2,3,4,6,7,8-HpCDF	67562-39-4	PCDDs, PCDFs, PCBs			✓		✓		
1,2,3,4,6,7,8,9-OCDF	39001-02-0	PCDDs, PCDFs, PCBs			✓		✓		
1,2,3,4,7,8-HeCDF	70648-26-9	PCDDs, PCDFs, PCBs		✓					
1,2,3,4,7,8,9-HpCDF	55673-89-7	PCDDs, PCDFs, PCBs		✓					
1,2,3,6,7,8-HeCDF	57117-44-9	PCDDs, PCDFs, PCBs		✓					
1,2,3,7,8,9-HeCDF	72918-21-9	PCDDs, PCDFs, PCBs		✓					
2,3,4,6,7,8-HeCDF	60581-34-5	PCDDs, PCDFs, PCBs		✓					
2,3,7,8-TCDF	51207-31-9	PCDDs, PCDFs, PCBs			✓	✓			
2,3,4,7,8-PeCDF	57117-31-4	PCDDs, PCDFs, PCBs		✓					
3,3',4,4'-TCB (PCB 77)	32598-13-3	PCDDs, PCDFs, PCBs	✓					✓	
2,3',4,4',5-PeCB (PCB 118)	31508-00-6	PCDDs, PCDFs, PCBs	✓					✓	
2,3,3',4,4'-PeCB (PCB 105)	32598-14-4	PCDDs, PCDFs, PCBs	✓					✓	
ammonia	7664-41-7	Inorganic	✓				✓		
aluminum	91728-14-2	Inorganic	✓						✓
antimony	7440-36-0	Inorganic	✓			✓	✓		
arsenic	7440-38-2	Inorganic	✓			✓	✓		✓
barium	7440-39-3	Inorganic	✓			✓	✓		
beryllium	7440-41-7	Inorganic	✓			✓	✓		
boron	7440-42-8	Inorganic	✓			✓			
cadmium	7440-43-9	Inorganic			✓	✓	✓		✓
chlorine	7782-50-5	Inorganic			✓		✓		

Table A-2. (continued)

COPC	CAS Number	Chemical Grouping	Emission Source			COPC			
			EDT Only	BGCAPP Only	Both EDT and BGCAPP	SDC	TDC	DAVINCH	EDS
chromium (3+)	16065-83-1	Inorganic	✓			✓	✓		✓
chromium (6+)	18540-29-9	Inorganic	✓			✓	✓		✓
cobalt	7440-48-4	Inorganic	✓			✓	✓		
copper	7440-50-8	Inorganic	✓			✓	✓	✓	✓
hydrogen chloride	7647-01-0	Inorganic			✓		✓	✓	
hydrogen fluoride	7664-39-3	Inorganic		✓					
iron	7439-89-6	Inorganic	✓				✓		
lead	7439-92-1	Inorganic			✓	✓	✓	✓	✓
manganese	7439-96-5	Inorganic	✓				✓		
mercuric chloride	7487-94-7	Inorganic			✓	✓ ^a	✓ ^a	✓ ^a	✓ ^a
methyl mercury	22967-92-6	Inorganic			✓				
elemental mercury	7439-97-6	Inorganic			✓				
nickel	7440-02-0	Inorganic	✓			✓	✓		
phosphorus	7723-14-0	Inorganic	✓			✓			
selenium	7782-49-2	Inorganic	✓			✓	✓		
silver	7440-22-4	Inorganic	✓			✓	✓		✓
tin	7440-31-5	Inorganic	✓			✓			
vanadium	7440-62-2	Inorganic	✓				✓		
zinc	7440-66-6	Inorganic	✓			✓	✓		

✓ Indicates that the listed COPC is emitted from the specified EDT unit and/or from the BGCAPP.

^a Speciated mercury emissions were reported as total mercury.

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